COMPUTERWORLD

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NEWSPAPER

Capitol Update

Groups Demand Stronger Rewrite

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C.— Four trade associations representing a substantial percentage of the U.S. computer industry last week jointly demanded that the House Communications Subcommittee make further changes to curb AT&T's monopoly power in its pending rewrite of the Communications Act of 1934.

The four groups demanded that the telephone company be allowed to manufacture terminal equipment, provide data processing services and develop commercial software products only through subsidiaries fully separated from AT&T Long Lines and Bell operating companies. If this is not done, they said they would use their weight to unseat the legislators responsible.

As presently drafted, H.R. 6121 requires only that AT&T market these items through separate entities.

Shortly after the statement was sent to Capitol Hill, the Communications

(Continued on Page 4)

Satellite Lack Seen Very Soon

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — A shortage of domestic satellite transmission capacity is likely within the next three years, according to a study made by a former chief of the Federal Communications Commission's (FCC) Common Carrier Bureau.

The increase in demand has been so rapid, particularly within the past year, "that many observers are forecasting saturation of the present in-orbit satellite capacity by 1983, which could lead to an unnecessary curtailment of satellite communications services unless additional capacity is provided," Walter Hinchman, now a private consultant, said.

Hinchman sees the increased demand coming primarily from five applications: interconnection of new local distribution networks supporting Xerox

(Continued on Page 8)

Russian Needs 'Staggering'

DP Cutoff to Squeeze Soviets: CIA

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — President Carter's recent cutoff of high-technology exports to the Soviet Union could put a severe crimp in Soviet plans to deploy DP capabilities more widely in Russian society, according to a recent Central Intelligence Agency (CIA) report on Soviet dependence on Western computers.

However, the President's move is not expected to hurt U.S. DP vendors, whose exports to the Soviet Union represent only a small percentage of their total sales (see story on page 61).

"Although Western computers comprise only about 4% of the total Soviet inventory, because of their superior performance and reliability, their relative contribution is much larger," the report claimed.

The U.S. has been by far the largest exporter of those computers over the last decade. According to the report, submitted recently to the Joint Economic Committee of Congress, 85% of the 776 large mainframes and minicomputers purchased by the Soviet Union from the West between 1972 and 1977 were U.S. models.

The year 1972 marked the beginning of East-West detente and the beginning of an upward spiral of Western computer sales to the Soviet Union.

Skirting the issue of how many, if any, of those computers have been diverted to Soviet military use, the report stated that the Soviet Union has come to rely heavily on Western

(Continued on Page 8)

NAS Brings Out Two More CPUs: Competitors for IBM 4341, '4351'

By Tom Henkel
CW Staff

PALO ALTO, Calif. — In its second major product announcement in as many weeks, National Advanced Systems here released a direct competitor to IBM's 4341 mainframe and a high-end system described as a competitor to a 4300 series machine IBM still has on the drawing boards.

NAS' entry-level Advanced Systems (AS)/3000N is said to provide slightly higher relative performance than the 4341. The AS/3000N offers 2M to 4M bytes of main memory (as does the 4341) and a five-channel processor. The 4341 offers a maximum of six channels.

The high-end AS/3000 was designed to compete with the yet-to-be announced IBM 4351, a machine whose performance is said to equal that of the IBM 370/158-3. The NAS machine is a 2M- to 8M-byte CPU with a five-channel processor. It offers a 20% to 30% performance improvement over that of the AS/3000N, NAS said.

(Continued on Page 2)

Profile of the Typical CW Reader

'Underpaid and Overworked'

By Marcy Rosenberg
CW Staff

They say they're underpaid — and many work up to 50 hours weekly.

What worries them about their careers, besides being underpaid, are little room to advance, not enough recognition from their superiors, shaky long-term job security and the ever-gnawing fear of becoming technologically obsolete.

But they expect to stay in their present profession for at least another five years.

Who are they? All are DPers who work in departments large and small at computer-using organizations spanning all parts of the country and a range of industries from manufacturing to financial to medical. And all shared salary information, demographic data and attitudes about work in general and about their employers in particular in a survey conducted by *Computerworld*'s research department.

In August 1979, CW researchers mailed 1,000

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CHARACTERISTICS \ SYSTEM	IBM 370/148	IBM 4341	NAS AS/3000N	NAS AS/3000	IBM 370/158-3	IBM 3031
Relative Performance	24	37	38	45	45	54
Memory Size in Bytes (Minimum-Maximum)	1M-2M	2M-4M	2M-4M	2M-8M	512K-6M	2M-8M
Purchase Price (Memory Size)	$488,750 (2M)	$257,250 (2M)	$325,000 (2M)	$425,000 (2M)	$1,525,100 (2M)	$684,000 (2M)
Memory Cycle Time (Nsec)	405-540	900	690-920	690-920	690-1,035	345
Machine Cycle Time (Nsec)	180-225	150-300	115	115	115	115
Channels (Minimum-Maximum)	5	3-6	5	3	0-6	6
Cache (Buffer) Size	None	None	8K	16K	16K	32K

The memory cycle time for the IBM 4341 was supplied by NAS.

NAS Brings Out Two More Mainframes

(Continued from Page 1)

The smaller AS/3000N is field-upgradable to the AS/3000.

An NAS spokesman said the AS/3000N is a revamped version of the Itel Corp. AS/5 mainframe. Although both the AS/3000N and AS/3000 are produced by NAS' parent company, National Semiconductor Corp., the spokesman said the AS/3000 was on NAS' drawing boards before National Semi took over troubled Itel's Data Products Division last October.

Both the AS/3000N and AS/3000 will support all current and past releases of IBM's DOS/VSE, VS1, MVS, VM/370, DOS and OS operating systems, NAS claimed.

While the AS/3000N costs $46,960 more for a 2M-byte model than the IBM 4341, NAS President E. Floyd Kvamme said deliveries of his company's mainframe will begin immediately. IBM has just started to deliver the 4341.

The 2M-byte AS/3000N costs $325,000; maintenance costs $1,550/mo. The AS/3000 costs $425,000 with a $1,650/mo maintenance fee.

Add-on memory for both models costs $50,000 per 1M-byte increment.

In addition to announcing the two mainframes, NAS also offered two software support services for the AS/3000 line.

Central Program Support Service and Local Program Support Service allow the user to tailor software support to meet specific needs, according to NAS, which claimed the two services will also make software support for the AS/3000 systems cheaper.

The Central Program Support Service, manned by NAS via a central office in Palo Alto, provides 24-hour telephone assistance over a toll-free telephone number. NAS said its service specialists at the site will be able to provide problem diagnosis and advice on temporary fixes and bypasses.

The Local Program Support Service for the NAS series is available for $600/mo.

Before announcing the AS/3000 machines, NAS released the AS/7000 series, three machines designed to compete with IBM's 30 series line [CW, Jan. 14]. Those machines are basically revamped versions of Itel's AS/6 processor, the NAS spokesman said.

Burroughs Increases Prices

DETROIT — In a little-noticed move, Burroughs Corp. raised prices on most of its products and services 5% to 10% late in its third quarter and during its fourth quarter last year.

The increases averaged 5% to 7% on purchase and about 10% on leases. However, prices on some products remained unchanged and in some cases were even reduced, Burroughs said.

While the company declined to break out price changes for specific product lines, it did say the products in the new B900 family were subject to price increases.

Burroughs said it began its reevaluation process in September.

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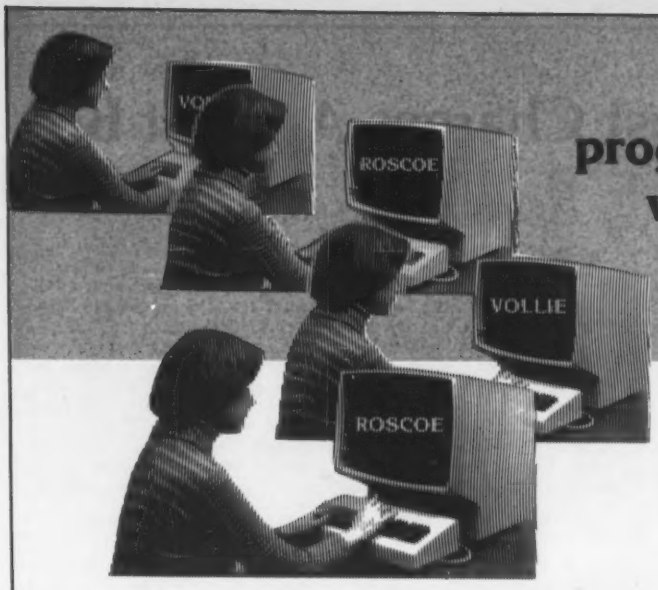

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VOLLIE, ADR's online program development system for DOS/VS/VSE, enabled one user to increase programmer productivity 50% while cutting staff by 50%. Another reported: "ADR must be using some really good techniques in order to get VOLLIE to perform the way it does."

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The LIBRARIAN, ADR's source management system, is fully integrated with ADR's online programming systems. One user recently stated: "The LIBRARIAN interface significantly complements our online development effort. Our programmers can bring a program in from The LIBRARIAN, update it online, and submit it. They can even bring in specified segments of a program. I think the combination of The LIBRARIAN and ADR's online software has really helped increase our programmers' productivity dramatically."

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Trial Slated for September

Justice Releases Antitrust Charges Against Bell

By Phil Hirsch
CW Staff

WASHINGTON, D.C. —The Department of Justice has released its final statement of antitrust charges against AT&T — a massive, three-volume, 2,000-page document. AT&T is expected to issue its final pretrial response to the charges next month, and the trial is scheduled to begin in September.

Running through the Justice Department statement is the contention that AT&T has been able to violate the Sherman Act largely because of the company's dominant market position. Thus, only by breaking up the Bell monopoly can the practices be prevented in the future.

As Justice put it, "Only relief that eliminates the existing inherent structural incentive and ability of AT&T to monopolize telecommunications services and . . . equipment will restore competition in these markets."

One of Bell's main defenses is that it has been subject to "pervasive" state and federal regulation and thus cannot be held responsible for any undesirable results. The Justice Department, in its statement, argued that the Federal Communications Commission (FCC) "has consistently been unable, due to lack of sufficient resources, to implement effectively its statutory telecommunications authority."

Justice also contended that "because the FCC has been unable to scrutinize [AT&T's] operations in an adequate manner, it also has been unable to fulfill its intended role in the gathering and analysis of essential data needed by state regulators."

Procompetitive Policies

The FCC has concluded for the second time that its procompetitive policies are not harming the telephone carriers or their customers, as the former have long contended.

Much of the telephone industry's attack has been focused on FCC decisions in the '60s, which allowed independent manufacturers to interconnect their terminal equipment to the dial-up telephone network, and on commission decisions in the '70s which authorized specialized carriers. In both cases, the telephone companies said they would suffer a loss of revenue.

The commission began a comprehensive investigation of these charges in 1974 and two years later said it had found no support for them. But several telephone companies and state regulatory agencies filed voluminous opposition comments, including detailed economic studies alleging harmful effects — economic and otherwise — from competition.

So the commission decided to take another look. That proceeding ended this month with the conclusion that FCC policies "encouraging competition in the telephone private line and telephone terminal equipment markets are continuing to benefit the public by speeding innovation and meeting unsatisfied communications needs."

Allegations of extensive inroads by the specialized carriers into the traffic of the established carriers, the FCC added, were based on "gross exaggeration" of the carriers' growth.

Treble Damages

Meanwhile a federal district court in Bridgeport, Conn., has assessed treble damages totaling $16.5 million against AT&T, Western Electric Co. and Southern New England Telephone Co. for violating the Sherman Act [CW, Dec. 10].

The case could influence the outcomes of several pending antitrust suits against AT&T, since they involve many of the same allegations. For example, both the Justice Department and MCI Communications Corp., two of AT&T's current adversaries, contend that Bell's two-tier telephone pricing scheme is anticompetitive. They also charge that the telephone company has used misleading ads, premature product and service announcements and various forms of behind-the-scenes pressure to frustrate competitors.

In the Bridgeport case, which was filed by Northeastern Telephone Co., an independent manufacturer of telephone and PBX equipment, AT&T and/or its two subsidiaries were found guilty of all these practices.

Bell is appealing the jury's verdict.

House to Investigate Comsat

CW Washington Bureau

WASHINGTON, D.C. — The House of Representatives' Communications Subcommittee will begin hearings next March to investigate the structure and operations of Communications Satellite Corp. (Comsat).

Among the items to be considered are Comsat's entry into the domestic satellite market. Through a subsidiary, Comsat General, it is a part-owner of Satellite Business Systems, manages the Comstar satellite system for AT&T and manufactures and sells satellite terminal equipment. It is also developing a proposal for direct satellite-to-home broadcasting.

"Congress has a responsibility to make sure that these activities are appropriate to the 1962 Comsat Act," Subcommittee Chairman Lionel Van Deerlin (D-Calif.) explained. "Before Comsat's activities develop further, Congress has to look at them and establish any necessary safeguards."

Trade Groups Demand Stronger Rewrite

(Continued from Page 1)

Subcommittee staff agreed to meet with representatives of each association and its member companies. The four associations represent a total of 786 companies with combined assets of $9.5 billion and 240,000 employees.

The associations include the Computer & Communications Industry Association (CCIA), the North American Telephone Association, which represents independent manufacturers of telephones and PBXs, the Association of Data Processing Service Organizations (Adapso) and the Independent Data Communications Manufacturers Association.

If the proposed changes aren't adopted, "we intend to block passage of the bill and will try to unseat the legislators responsible," CCIA President Jack Biddle said.

The joint statement made the same basic threat: "H.R. 6121 must be modified to achieve acceptable public policy. As drafted, we would regretfully be forced to oppose the bill, to the full extent of our collective resources, insofar as it relates to these issues. It is our sincere hope, however, that we can work jointly with the subcommittee to achieve sound policy . . ."

Notably absent from the joint statement was the Computer and Business Equipment Manufacturers Association (Cbema). "It's too bad they've gone along with IBM," Biddle commented. "It's shocking that Honeywell, [Inc.] Burroughs [Corp.] and the other non-IBMers who belong to Cbema don't realize the danger they face from AT&T if the changes proposed in our statement aren't adopted."

In their statement to the House subcommittee, the four trade associations contended that H.R. 6121 as presently drafted "does not adequately address the anticompetitive impact of carrier activities as they affect equipment manufacturing and marketing, software production and the provision of data processing services. These issues, we believe, require full and complete consideration . . . To the extent that full separation in these areas is not implemented, the bill . . . deprives users of price and product competition in . . . the very infrastructure of our nation's information future."

What the four trade associations are essentially demanding is full separation of the Western Electric Co. and Bell Telephone Laboratories from AT&T's telephone service arms. They also want the bill to prohibit a Bell operating company from providing computer support to a subsidiary it might set up for computer-based services.

Legislation pending in the Senate (S.611) is substantially in accord with these demands. It requires that AT&T, in order to offer "any competitive telecommunications service . . . equipment, information service or . . . software" must "provide" them through "one or more entities . . . fully separated from any carrier or entity not subject to effective competition."

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U.S. vs. IBM Antitrust Case Marks 11th Anniversary

NEW YORK - Another milestone has quietly come and gone in the U.S. vs. IBM antitrust case — the 11th anniversary on Jan. 17 of the filing of the case by the U.S. Department of Justice.

"It's really not the kind of occasion you commemorate — like the 10th anniversary," one court watcher noted.

And still the trial drags on. Jan. 18 was the 663rd trial day, and the transcript pages number almost 100,000.

Since the trial resumed on Jan. 7, court has been meeting daily. It is presently hearing IBM's 26th witness, IBM executive John F. Akers.

In 1979, the court clerk counted 88 actual trial days, compared with 153 days in 1978. Chief Judge David N. Edelstein's clerks are quick to point out that during 1979 Edelstein issued 18 memoranda and opinions, and nine orders, many of which were handled during a three-month adjournment of the trial in the spring.

The trial was also delayed in 1979 by IBM's petition to the U.S. Court of Appeals to have Edelstein removed from the case because of the bias and prejudice he has allegedly shown against IBM. That decision is still pending in appeals court.

The fifth anniversary of the trial itself will occur on May 19.

Lease Prices for Amdahl 470s Raised 6% to 9%

By Marcia Blumenthal
CW Staff

SUNNYVALE, Calif. — In a move to stimulate purchases and offset the cost of borrowing to fund its lease program, Amdahl Corp. hiked its prices for two- and four-year leases between 6.7% and 9.3% for its 470 series of large-scale systems.

These price increases are effective March 15. Users entering into leases before March 15 with installation prior to June 30 will not be subject to the price hikes during the first year of their lease agreements.

The lease rate hikes follow on the heels of an average 20% reduction in the purchase price of the 470 series last November [CW, Nov. 12]. Purchase and maintenance prices for these systems were not subject to increases, Amdahl said.

In addition, Amdahl hiked the monthly lease rate on its VM/PE performance enhancement program 16.6%, from $1,500 to $1,750.

While nearly coincidental with IBM's across-the-board purchase and lease price increases late last year [CW, Jan. 14], Amdahl's move was not made in response to IBM's action, but rather to capitalize on a swing back to purchases the firm observed during its fourth quarter, Amdahl said.

Most price hikes were between 6.7% and 7.4% except on four-year leases for its 470V/7B, V/7A, V/7 and V/8 models, for which prices ranged between 8.2% and 9.3%.

The new price lineup for two-year leases, including maintenance, on systems with 4M bytes of main memory and eight channels is as follows:

- The new monthly lease price for a 470V/5 is $54,350; the old price was $50,800.
- The 470V/5II will lease for $57,575, up from $53,800.
- The 470V/6's new rate is $61,750; the old rate was $57,720.
- For a 470V/6II the new rate is $64,975 vs. the old rate of $60,720.
- A 470V/7B will now lease for $62,350, up from $58,125.
- A 470V/7A will lease for $68,150, up from $63,450.
- A 12-channel, 4M-byte 470V/7 will lease for $82,875, vs. the current rate of $77,200.
- A similarly configured 470V/8 will lease for $89,425, up from $83,750.

On the four-year plan, new monthly lease prices for systems configured with 4M bytes and eight channels, including maintenance, are as follows:

- The 470V/5 will lease for $45,500, up from $42,500.
- The 470V/5II will lease for $48,150, vs. the present rate of $45,000.
- The 470V/6 lease rate will be $51,700, up from $48,300.
- The 470V/6II's new rate will be $54,350, up from $50,800.
- The 470V/7B will lease for $50,350, up from $46,500.
- The 470V/7A will lease for $55,000, vs. the current rate of $50,750.
- The 470V/7 and 470V/8 with 12 channels, 4M bytes and maintenance rose respectively to $66,900 from $61,750 and $72,150 from $66,000.

IBM Earnings Down in 1979

ARMONK, N.Y. — Inflation, losses on foreign currency exchanges and a swing from equipment purchases to leases weakened IBM's fiscal prowess in 1979, causing earnings to drop 3.2% and revenues to advance only a modest 8.5% from 1978 levels.

Although expected by analysts, IBM's 1979 performance compared poorly with its growth in the previous five years, when increases in annual revenues ranged between about 11% and 16% and earnings kept pace by rising between 8% and 20.5%.

IBM ended 1979 with revenues of $22.8 billion compared with just over $21 billion in 1978. Earnings netted a bit over $3 billion or $5.16 per share, dropping from 1978's net income of $3.1 billion or $5.32 per share.

In IBM's fourth quarter, earnings totalled $1.008 billion or $1.73 per share, a .6% dip from the $1.014 billion or $1.74 earned in the corresponding quarter of 1978. However, this was the smallest of the three earnings declines IBM experienced in 1979. Compared with 1978 results, IBM's earnings dropped 3.4% in the second quarter and a hefty 18% in the third quarter.

All earnings were adjusted for the four-for-one stock split last May.

Revenues for the final 1979 quarter totaled $6.8 billion, a 6.1% increase from 1978's final quarter revenues of $6.4 billion.

Commenting on the results, IBM Chairman Frank T. Cary attributed some of the company's lackluster performance to foreign currency exchange losses. The losses totaled $52 million in 1979 compared with gains of $113 million in 1978.

Foreign operations produced revenues of $12.2 billion compared with just over $11 billion in 1978. Earnings from foreign business were $1.4 billion compared with $1.6 billion.

Aside from foreign currency exchange losses, Cary acknowledged that purchase revenues showed only "small increases for both the full year and the fourth quarter." While IBM would not disclose what proportion of 1979 revenues were derived from leases, Cary did say revenues from rentals and services increased 8.7% for the year.

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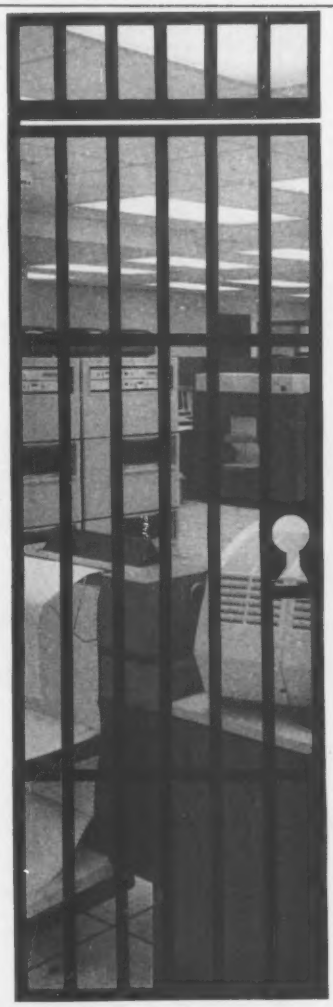

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Show Sees Series/1 Data Collection Tool Debut

By Brad Schultz
CW Staff

NEW YORK — A data collection software package for retail users of the IBM Series/1 minicomputer was announced here last week at the annual National Retail Merchants Assocation (NRMA) convention.

Store managers who attended the four-day meeting were also shown a teleprocessing system for controlled retail data collection and distribution and a turnkey system for merchandising and retail finance applications.

The Autopoll/1 data collection package from Vienna, Va.-based JEM Associates runs on a Series/1, but can support point-of-sale (POS) terminals in data networks with processors from a number of different vendors. In fact, Autopoll/1 interfaces with virtually any communicating CPU, a JEM Associates spokeswoman stated.

Specifically, Autopoll/1 "makes sales information readily retrievable so that the retailer can keep a close eye on his operations even if they are scattered over a wide area," the spokeswoman maintained.

More than 80 separate programs comprise Autopoll/1, including three main tasks able to run concurrently, she declared.

The Autopoll/1 user is required to license an IBM Series/1 and that vendor's Event Drive Executive (EDX) utility software. According to JEM Associates, a typical system to drive the package might include a 64K-byte processor, IBM's 4962 disk/diskette, either a 4979 or 4978 console, a timer feature, a 4974 or other printer, IBM's 1610 asynchronous line control and its 2075 single-line control for bisynchronous communications.

Depending on the extent of customization, cost of the package would vary from user to user within the $5,000 to $10,000 range, the spokeswoman said. JEM Associates is located at 1917 Dogwood Lane, Vienna, Va. 22180.

CW At NRMA

ASI Offering

The NRMA convention also featured a presentation of ASI Teleprocessing's Store Data teleprocessing system for data collection and distribution.

Store Data handles four retail teleprocessing functions, a spokesman said. They are:

- Automatic polling and collecting of data from any mix of geographically dispersed POS terminals.
- Preparation of a data journal on 9-track magnetic tape and/or disk pack for processing by a central mainframe.
- Logging of statistical data and automatic preparation of up to six specialized reports that describe a polling session.
- Downloading of user-specified software and data files to any of the network's terminals.

Three versions of the system are offered. The Store Data 3610, 3620 and 3630 support up to four, 12 and 16 communications lines, respectively, and can poll 200, 500 and 1,000 terminals, respectively. The latter two models include Digital Equipment Corp.'s PDP-11/34 computer system. The 3610 version features a DEC PDP-11/04. All versions run under DEC's RT-11 operating system.

ASI Teleprocessing declined to give prices for Store Data, explaining that each configuration is tailored to a particular user situation. The vendor is headquartered at 101 Morse St., Watertown, Mass. 02172.

Turnkey Unveiled

Finally, Stamford, Conn.-based STS Systems, Inc., an OEM, unveiled a turnkey computer system for retail chains. Called Store, the system is based on Data General Corp. Nova and Eclipse hardware under the Micos operating sytsem. Peripherals are made by Xerox Corp. subsidiary Diablo Systems, Inc. and by Control Data Corp.

But STS has written all of Store's applications software. Modules are featured for processing purchase orders, replenishing stock, an open-to-buy function, receipts and returns and distribution of inventory (from warehouse to store).

The full price of Store depends on the user environment. A typical two- or three-store chain might require a system costing at least $70,000, the spokesman estimated. By itself, the Store software goes for $25,000. In the U.S., STS is based at Suite ID, 2 Landmark Square, Stamford, Conn. 06901.

Business Mini From ICL Can Be Tied to Mainframe

The ICL System 10 Model 320

IRVING, Texas — ICL, Inc., the U.S. subsidiary of Great Britain's International Computers Ltd., has unwrapped an expandable small business computer that can be used as a stand-alone processor or as an asynchronous/-bisynchronous satellite system linked to a mainframe host.

The System 10 Model 320 features a 60K-byte semiconductor memory, which can be boosted to 200K bytes of usable memory. It is software-compatible with the firm's System 10 Model 220, which was formerly marketed by Singer Business Machines. ICL acquired ownership and control of Singer's marketing and manufacturing operations in 1976.

Designed to grow in capacity along with the user's needs, the Model 320 utilizes cartridge module disk drives which can handle up to 60M bytes of data or storage module drives with a capability of up to 160M bytes. In either case, the minimum disk capacity is 20M bytes, a spokesman noted.

The computer system can be fitted with 800- or 1,600 bit/in. industry-compatible magnetic tape drives and includes the firm's System 85 CRT terminal. Under multiprogramming, as many as 20 CRT stations can communicate simultaneously with the CPU, each accessing a different program, the spokesman claimed.

Finally, the system can be supplied with one of three matrix printers rated at 60-, 120- and 180 char./sec and four models of line printers rated at 75-, 150-, 300- and 600 line/min.

Operating System

ICL provides a standard disk management facility software package as the unit's basic operating system and has a number of application packages for routine accounting and administrative chores on an unbundled basis.

While the system can be configured with communications modems and function as a data gathering and transmission station, the Model 320 is intended to compete with current small to mid-sized computer offerings including IBM's System/34 and System/38, Univac's BC/7 and several other systems marketed by Basic Four Corp., Burroughs Corp. and Wang Laboratories, Inc.

A specialized version of the Model 320, the Model 310, is available for use in retail store operations as part of an integrated retail accounting system.

Prices for the ICL system range from $35,000 to $100,000, depending on the amount of disk memory and peripherals included with the package, the spokesman explained from the firm's Distributive Systems Division, 415 E. Airport Freeway, Irving, Texas 75062.

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DP Specialists Not Needed

Turnkeys OK for Most Retailers: Accountant

By Brad Schultz
CW Staff

NEW YORK – DP specialists are not needed by most of the nation's computerized independent retailers, according to the principal author of a DP systems procurement guide endorsed by the National Retail Merchants Association (NRMA).

Speaking at the NRMA's annual convention here last week, Jack Rosenstein asserted that in most cases, an independent retailer grossing between $1.5 million and upwards of $100 million annually can now acquire a "turnkey" system without having to acquire technical personnel too.

That doesn't mean layoffs are ahead for systems analysts and programmers in the retail industry, however. According to the senior principal of Laventhol & Horwath, a Philadelphia-based accounting firm, retailers have never hired large numbers of DP professionals in the first place, but where DPers do work in the retail industry, their services may well be very much in demand despite the advent of end user-oriented computer systems.

Nevertheless, nearly all but the largest of automated retailers can assign a person without a technical background to coordinate DP functions, he said, adding that a retailer should automate if one of the following conditions prevail:

- Inventory turnover is too slow.
- Management cannot react to marketplace changes fast enough.
- Management cannot get all the information it needs for merchandising decisions.
- Management feels it has lost control of the retail operation.

If any of those conditions holds for an already-automated retailer, the user should investigate its system's effectiveness, Rosenstein added.

Turnkeys Recommended

Last year, NRMA published an "Independent Stores EDP Specification" developed by Rosenstein and other Laventhol & Horwath management consultants to help merchants find and implement appropriate computer systems. The guide recommends that retailers focus on vendors of turnkey systems in their search for the right gear.

Laventhol & Horwath contends that a genuine turnkey vendor offers the end user virtually all the hardware, maintenance, software and programming services it requires. NRMA's EDP Specification advises retailers to minimize the number of sources for DP goods and services. If possible, it says, the store should place the bulk of its DP orders with a single supplier experienced in retail applications.

However, the guide points out that optical character recognition devices and point-of-sale terminals probably cannot be purchased from the retailer's main source of hardware and software.

Further, merchants with especially complex applications should consider hiring a consulting bureau to help locate a vendor, Rosenstein suggested. And during the contract negotiation phase, the store's legal counsel should review all purchase agreements before they are signed.

A competent attorney does not need expertise in computer technology to address the crucial aspect of vendor liability for contract infringement. But, if possible, the store should have the review done by an attorney conversant with user law, Rosenstein said.

By minimizing the number of suppliers of DP goods and services, the retailer undergoing a major procurement or facility upgrade may avert a rash of "fingerpointing" in the event its system's performance later fails to meet expectations, Rosenstein explained. "There are plenty of turnkey vendors in the U.S. and Canada," he added.

To an extent, the retailer should investigate the financial situation of any prospective supplier, Rosenstein told the NRMA delegates. Some vendors only remain in business a short time, he noted. Since the process of specifying and implementing a configuration often takes more than a year, the merchant should be confident that the vendor will still be able to support its products when the system finally starts to work.

CW At NRMA

As to specifying the configuration, Rosenstein recommended that the retailer emphasize its applications rather than dwell on physical processing capabilities and capacities. The system should be tailored to the store's particular management information requirements. Arbitrary specifications of main memory size and processor throughput, for example, may not prove realistic if they are made the starting point of negotiations, he indicated.

Stores may obtain useful advice on DP procurements from organizations like NRMA and more specialized associations that have insight into particular types of retailing, Rosenstein concluded.

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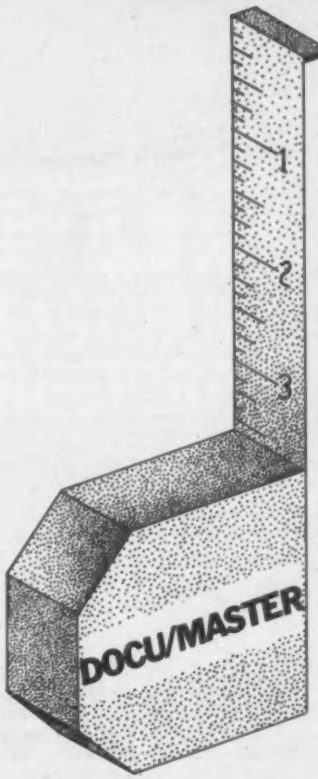

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DP Cutoff to Put Squeeze on Soviets: CIA

(Continued from Page 1)

equipment and technology to make up for the lack of widespread DP applications in its general economy. To date the Soviet DP industry has been primarily devoted to producing military and scientific machines.

One measure of the Soviet dependence on Western computer technology is that the Russian Ryad series of computers — "intended to become the main data processing computers for the 1980s — is based on IBM 360 and 370 architecture.

"By making Ryad compatible with IBM, a large [Western] library of IBM software would be available to the Soviets," the report noted. "The USSR could also supplement domestic production by importing IBM machines and compatible peripherals manufactured by IBM and other Western firms," according to the Soviet plan as perceived by the CIA.

This analysis argues that the Soviet Union is neither willing nor able to divert development and production resources to automate its economy with the type of advanced DP technology already in wide use abroad.

For one thing, the report explained, "the Soviet gap in production [capabilities] is complemented by a gap in technology." Russian DP systems are characterized as suffering from "primitive software," and the Soviet DP industry is still troubled by a "failure to master the production of advanced types of integrated circuits."

Large-Scale Needs

In the face of these difficulties, "the Soviets need large numbers of data processing computers to facilitate planning and to reduce the cost of processing the enormous volume of economic data generated by the economy; increase efficiency in the management of enterprise; increase plant productivity and product quality through the application of computers in process control; and accelerate research and development in many areas.

"Finally, the wide application of computers offers the prospect of releasing large amounts of labor at a time when the supply of labor is becoming tight.

"The number of computers needed to flesh out all of the Soviet schemes is staggering," the report concluded, noting that "four-fifths of all large computers imported are used for economic — that is, general data processing — applications."

By turning to the West, particularly the U.S., to fill these needs, the Soviet Union has been able to obtain machines that "contain performance capabilities that the Soviets cannot match" and that "utilize computer software that the Soviets have not developed."

Training and Experience

Further, and of even higher importance, "one of the greatest benefits to the Soviets from Western computer systems is the training and experience gained," — training that the Soviets "cannot duplicate," the report said. The large systems imports "typically involve full installation, maintenance and software support. These are extractable benefits with a multiplier effect.

"The training and experience gained with a single system can be applied to the development of a cadre of Soviet specialists capable of training others. In time, the accumulating expertise can be applied to the development of native software."

In summary, "the main effect of imports of large computers has been to enable the USSR to accomplish tasks that otherwise would have been extremely difficult or impossible to accomplish to the same extent or within the same time frame set by Moscow."

The same can be said of minicomputer imports, the report added, reporting that Soviet minicomputers are scarce and, by Western standards, primitive, particularly in the area of software.

Itel and Lloyd's Reach Accord

SAN FRANCISCO — Itel Corp. and Lloyd's of London have reached an agreement in principle for the basis of a settlement of claims made by Itel for losses it incurred on computer lease revenues insured by Lloyd's.

The final settlement, subject to a variety of conditions including approval by Itel's lenders, is expected to be made by the end of February. The settlement would resolve all outstanding disputes concerning Itel's claims, which are reportedly in the $150 million to $200 million range.

Since filing claims, Itel has transferred the bulk of its computer business to National Semiconductor Corp.'s National Advanced Systems unit.

In other news, Itel said the Securities and Exchange Commission (SEC) has started a private investigation of the firm and has subpeonaed its business records. This is not an unusual action for the SEC, particularly for financially troubled firms, Itel noted.

For its third quarter Itel posted a $176.1 million loss.

Shortage of Satellites Seen in Three Years

(Continued from Page 1)

Corp.'s proposed Xerox Telecommunications Network (Xten) and similar offerings; expansion of the specialized carriers' services to new service areas; provision of similar services by the independent telephone industry; satellite distribution of conventional and subscription TV programming; and growth of electronic message services (EMS).

Hinchman's prediction of a near-term satellite circuit shortage was based primarily on independent studies recently conducted by International Telephone and Telegraph Co. (ITT), Western Union Telegraph Co., and Future Systems, Inc. All three found that existing and planned capacity will be saturated by the end of 1983.

The studies also show "that the voice market will grow at about 10% per year through 1990, data at 10% to 20%, EMS at about 20%, video at 3% and teleconferencing at 10% to 30%," Hinchman noted.

The projected rate of growth in satellite circuit utilization exceeds these market growth rates, he added, which indicates that although some of the increased traffic will be carried on terrestrial networks, a significant percentage will be captured by satellites. For example, ITT has forecast that satellite transponder demand through 1990 for voice services will grow at 30%, for data services at 60%, and for video services at 14%.

Other indications that present domestic satellite capacity is nearing the saturation point include Western Union's recent announcement that it plans to again enter the switched voice telephone market. The company probably will use its Westar satellite system to support that offering, Hinchman said.

If that happens, it should encourage smaller telephone companies and specialized carriers to use satellites, particularly since they will then be able to provide nationwide service without a massive capital investment.

"Value-added carriers such as Tymnet [Inc.] and GTE-Telenet [Communications Corp.], while still small, are also experiencing rapid growth and may become candidates for satellite facilities," Hinchman added. GTE-Telenet has already announced plans to employ satellite transmission [CW, Dec. 17].

EMS in Demand

Electronic message services are another major source of increased demand. Although efforts by the U.S. Postal Service to offer such services have encountered regulatory problems, a number of commercial EMS suppliers are likely to be authorized as a result of the Xten proceeding now under way at the FCC.

Hinchman's study, entitled "Future Demand for Domestic Satellite Capacity," was commissioned by Hughes Communications, Inc. It was submitted to the FCC recently to help justify Hughes' request for authority to operate a new 4/6 GHz domestic satellite system.

The proposed system consists basically of two in-orbit satellites, each having 24 transponders with 40 MHz, plus a ground spare. The system would service the 48 contiguous United States/plus Puerto Rico and the Virgin Islands.

So far, only Western Union has objected to the Hughes proposal. An attorney for the company said he expects the commission to act on the application in "six to nine months."

NCR Ordered to Pay Chatlos in Warranty Breach

By Marcia Blumenthal
CW Staff

NEWARK, N.J. — A U.S. district court here has ordered NCR Corp. to pay Chatlos Systems, Inc. more than $120,000 for damages resulting from a breach of warranty.

The judgment is believed to be the first to include an award for lost profits, Chatlos' attorneys said.

The case, which was tried last summer, also charged NCR with fraudulent misrepresentation and computer malpractice [CW, Aug. 10] in its contract for a 399 system running with a 656 disk subsystem. However, the court did not find NCR guilty of either charge.

NCR is appealing the judgment and will file the appropriate briefs with the court in the next few weeks, the vendor's attorney disclosed. Chatlos is cross-appealing the award, seeking more money in damages, according to Barrett F. Kalb, Chatlos' attorney.

Although a small case, the Chatlos decision may have greater significance because about eight similar cases are pending against NCR, Kalb added.

Chatlos, a maker of cable pressurization equipment, sued NCR because the 399 configured with a 656 disk subsystem would not run the applications Chatlos' had contracted NCR to provide. Chatlos bought the system in 1974, intending to use it for six applications, the most important of which was inventory deletion.

Between the delivery of the system in early 1975 and Chatlos' ultimate refusal to allow NCR to continue installing the system in September 1976, NCR had to assign six different programmers and analysts to the project.

Other than the payroll program, Chatlos charged the applications would not run on the system. The suit sought $444,926 in damages and additional punitive damages from NCR.

In making the award, the court did find that NCR had breached its express warranty to Chatlos because the vendor claimed the system would function as stipulated in the purchase order. Breach of warranty damages totaled $57,152, and consequential damages, including $6,450 for loss of profits, totaled $63,558.

However, because NCR continued to try to get the system up and running, the court did not find that NCR engaged in fraudulent misrepresentation of the product. Therefore, the judge did not award punitive damages.

Similar cases pending are the Dominican Sisters of Ontario, Inc. vs. NCR and the Columbia Lutheran Charities, Inc. vs. NCR. The equipment involved in these cases are respectively an NCR 8200 and an NCR 399, both of which did not function as warranted by NCR, according to Douglas Combs, the attorney handling these cases.

Each of these suits is seeking about one half million dollars in damages and additional punitive damages.

Eniac Inventor Dead at Age 72

AMBLER, Pa. — Dr. John W. Mauchly, a Univac consultant and co-inventor of Eniac, the world's first all-electronic digital computer, died earlier this month at a hospital here in this suburb of Philadelphia. He was 72 years old.

Mauchly began experimenting with computers and electronics while he was head of the Physics Department at Ursinus College in Collegeville, Pa. During his eight years at the school, he worked on a weather analysis project which led him to the conviction that a high-speed electronic device was necessary to perform complex environmental calculations.

In 1941, Mauchly left Ursinus to join the Moore School of Electrical Engineering at the University of Pennsylvania in Philadelphia. It was there that he met Dr. J. Presper Eckert, Eniac co-inventor. The following year, the two men submitted a proposal to the U.S. Army describing an electronic computer, which resulted in a contract from the Army's Ordinance Department to build the machine.

Basically conceived to help develop new weapons during World War II, the Electronics Numerical Integrator and Computer (Eniac) was completed in 1946, filled 15,000 square feet of floor space and weighed 30 tons. The machine also had more than 17,000 vacuum tubes.

Eniac functioned until Oct. 2, 1955, when it was dismantled and part of it was sent to the Smithsonian Institution in Washington, D.C., where it is part of an exhibit on computing.

Mauchly and Eckert left the University of Pennsylvania in 1947 to form their own company, the Eckert-Mauchly Computer Corp., where they developed a second computer in 1949 called Binac, for Binary Automatic Computer. Binac was the first computer to be programmed by internally stored instructions.

Later, Mauchly and Eckert built Univac I, for Universal Automatic Computer, which was installed in the U.S. Bureau of the Census in 1951 and was considered to be the first general-purpose commercial computer.

Mauchly was a founder and president of the Association of Computing Machinery and the Society for Industrial and Applied Mathematics. Donations can be made to the John W. Mauchly Memorial, Van Pelt Library, the University of Pennsylvania.

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Typical Reader: Underpaid, Overworked

(Continued from Page 1)

questionnaires to a random sample of subscribers who work at user organizations. The questionnaires yielded a 51% response rate, or 514 usable responses.

What follows are selected survey findings that form a CW reader profile. Where possible, results are compared with findings from CW's 1971 survey and to national statistics from other sources.

A look at background information revealed several trends:

- Of the respondents, 77.2% have spent most of their working years in DP. This includes 20.3% who changed industries while remaining in DP and 16.9% who changed careers within the DP field.
- More than half (57.3%) of those surveyed have worked in DP for more than 10 years.
- Within their employing organizations, 83% said they have managerial responsibilities. Of these, 43.1% consider themselves middle management; 23.1% supervisory management; and 16.8%, top management.
- The level of formal education extends at least through a four-year college for a majority (61.3%) of the respondents. In this group, 35.4% hold bachelor's degrees; 22.1% earned master's degrees; and 3.8% hold or are candidates for doctorates.
- Business was the most popular major of those who attended college at any level, with 31% naming this course of study. The next major cited most often was computer science (18.7%), followed by mathematics (15.3%) and engineering (12.1 %).
- The overwhelming majority (92.8%) of respondents were male.
- The modal age range of this population fell between 35 and 44 years. Most (77.5%) were between 26 and 44 years old. None were over 65.
- Eighty percent of the respondents are married, a figure closely corresponding to recent Bureau of Census estimates that 77% of the U.S. population still resides in husband/wife households.

Salaries Double Since 1971

Turning from past to present, the CW questionnaire asked respondents to calculate their own gross yearly salaries as well as averages by position for individuals who work directly with or for them. This hiked the total sample reporting salary data to 5,414. Figures do not include deferred compensation put into retirement or profit-sharing plans.

CW then compiled overall position averages and broke these out by size of DP department and by U.S. region. A list of job titles was provided and repondents were asked to categorize themselves.

Salaries nearly doubled in the last eight years for a number of job titles CW examined in 1971 and again in 1979 (see Figure 1). This finding is more or less in line with the rising inflation rate as indicated by the Consumer Price Index, which jumped about 94% in the 1970s.

The average salary increases were:

- DP/management information systems (MIS) managers earned $29,125 in 1979, up from $16,300 in 1971.
- Salaries for managers of systems analysis jumped from $14,900 in 1971 to $29,200 in 1979.
- Computer programming managers' salaries rose from $14,010 to $26,000.
- System analysts' salaries climbed from $11,800 to $23,900.
- For computer operations managers, salaries increased from $11,050 to $22,100.
- For experienced programmer/programmer analysts, salaries rose from $12,100 to $21,950.
- Computer programmers' salaries bolted from $9,400 to $18,950.

Where DP job names were directly comparable, the overall average salaries reported by CW readers came in fairly close to national salary data from the Weber Survey on Data Processing Positions by A.S. Hansen, Inc. for the year ending in June 1979 [CW, Dec. 10].

For example, Hansen's top DP executive, the "corporate DP manager," earned an average of $41,700 last year, while CW's top position, the "vice-president of DP/MIS," earned $41,100. Similarly, managers of systems analysis averaged $29,700 according to Hansen and $29,200 according to CW.

Hansen's average salary for the data base manager/administrator was $28,500 compared to CW's $29,725, and Hansen's figures corresponded to CW's for computer operations managers at $21,800 and $22,100, respectively.

Salaries and Department Size

Across most job titles, CW reader salaries, as expected, directly correlated to size of DP department as measured by number of employees (see Figure 2). One exception was the data base manager/administrator, a relatively new computer industry professional, where salaries did not rise as DP departments grew. That the sample size for this job title was considerably smaller than for other positions charted may contribute to the results.

As Figure 2 indicates, user organizations with small DP departments — one to 10 employees — consistently pay salaries that fall below the overall sample average for both management and nonmanagement positions. Conversely, salaries reported at organizations where DP departments employ more than 101 staffers are consistently higher than the overall sample average for each job title.

Regional variations were harder to peg because of small samples reporting

(Continued on Page 12)

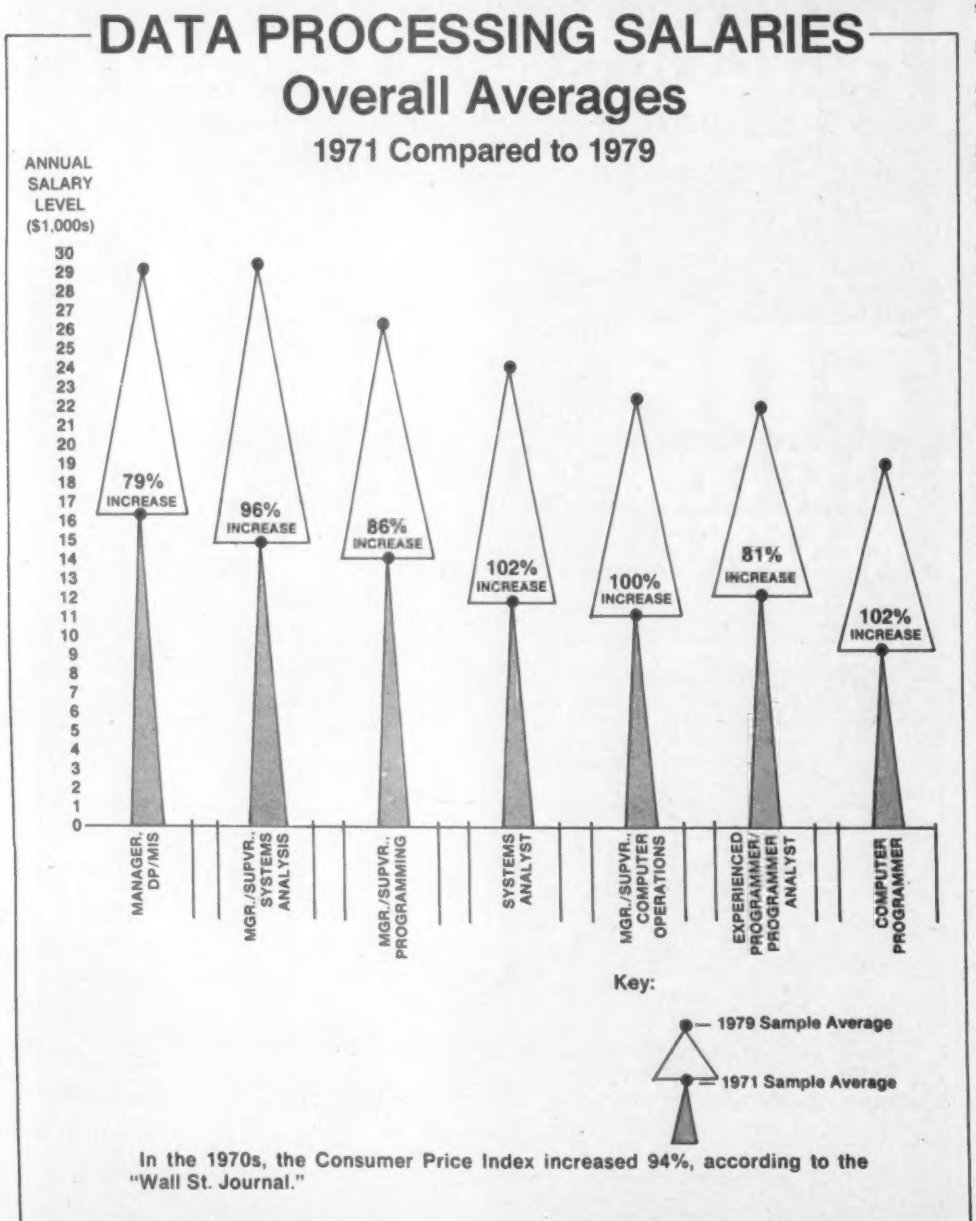

Figure 1

DATA PROCESSING SALARIES

By Size of DP Department

1979

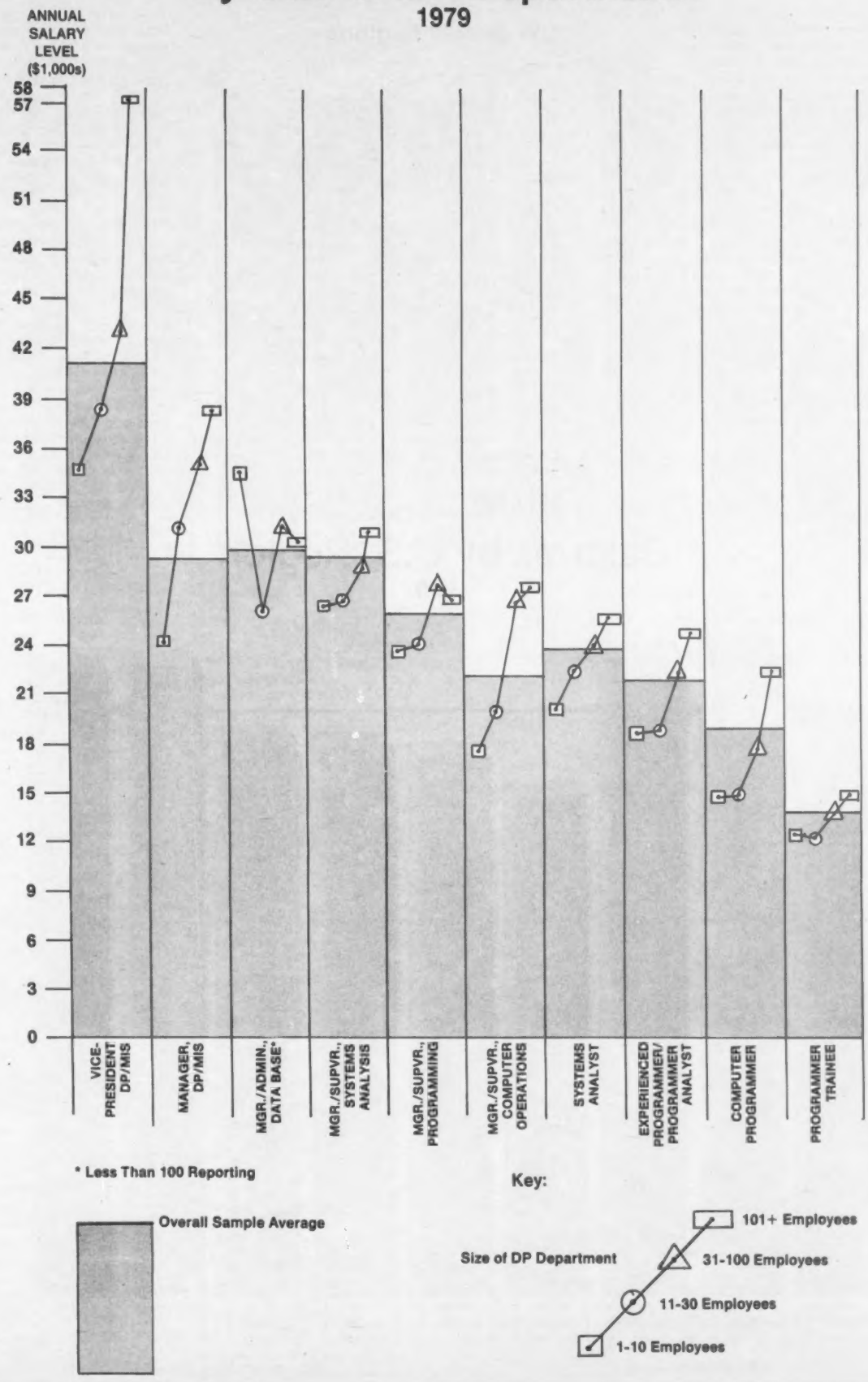

Figure 2

Half of Those Surveyed Feel Underpaid

(Continued from Page 10)

for a number of geographic areas. CW divided the country into nine regions (see Figure 3) with the largest number of respondents (19.8%) reporting from the East North central area. The second largest group (18.6%) came from the Middle Atlantic region followed by 15.5% based in the South Atlantic and 13.4% from the Pacific area. The number of respondents for all other regions equaled less than 10% of the total.

Geographic salary breakdowns for job categories where the largest samples reported per region appear in figures 4, 5, 6 and 7. As these graphs show, high-paying U.S. regions — those that most often pay respondents more than the overall sample average — are the Mid-Atlantic, New England and Pacific areas.

A factor not to be overlooked when examining 1979 salary data was the Carter Administration's 7% wage limit, imposed last year to help combat inflation. When asked to quantify their last salary increase, a majority of CW readers — 64.7% — said they received raises between 5% and 10%. The mid-point of this range is 7.5%, the average percent increase in DP salaries quoted by Hansen.

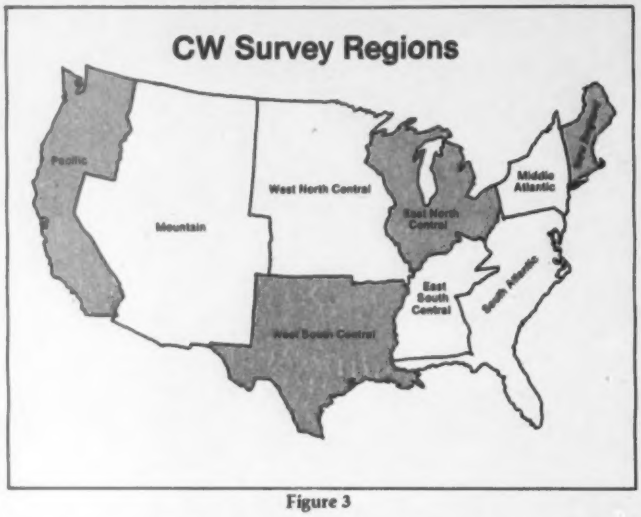

Figure 3

Although 87.4% of the CW readers surveyed are at least partially satisfied with their last raise, more than half (55.2%) feel they are underpaid. In fact, professional earning power emerged as a major concern of this population.

For example, CW readers were asked to choose from a list of 11 items the three most important elements they would seek in another job. "More money" took top priority, selected by 68.4% of the respondents, followed by "more opportunity for creativity" for 48.2% and "more power/control" for 32.7%.

Others (32.1%) want better benefits, 21% seek a higher title, 18.5% wish to work in another part of the country and 17.5% hope their next job will be less stressful.

The least chosen items suggest that the size of the employing organization, the ability to get along with colleagues and the number of working hours per week have little bearing on job satisfaction.

What are those hours? Almost 35% of the respondents work 41 to 45 hours per week, followed by nearly 29% who work between 46 and 50 hours weekly. Few put in less than 35 hours and al-

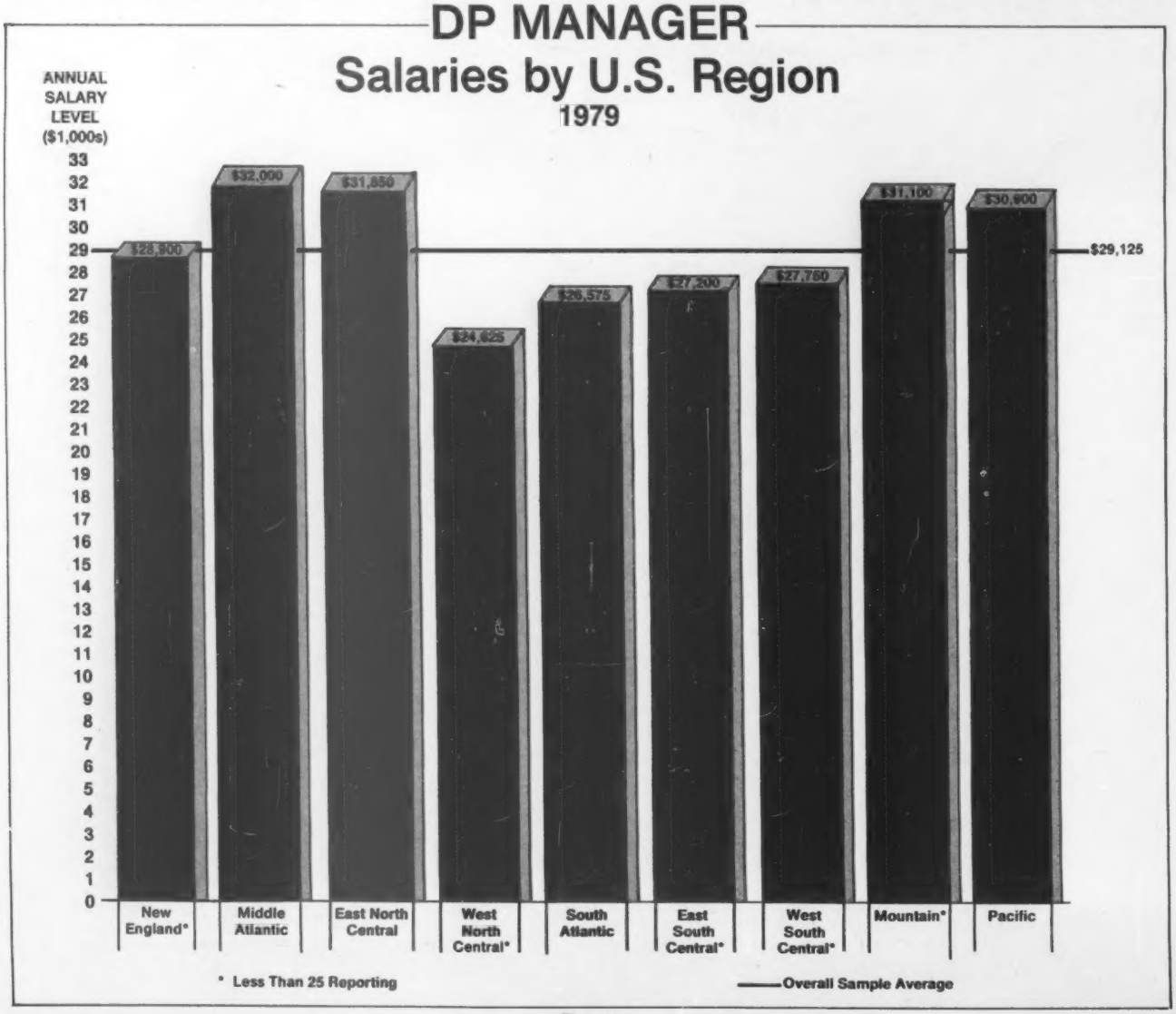

Figure 4

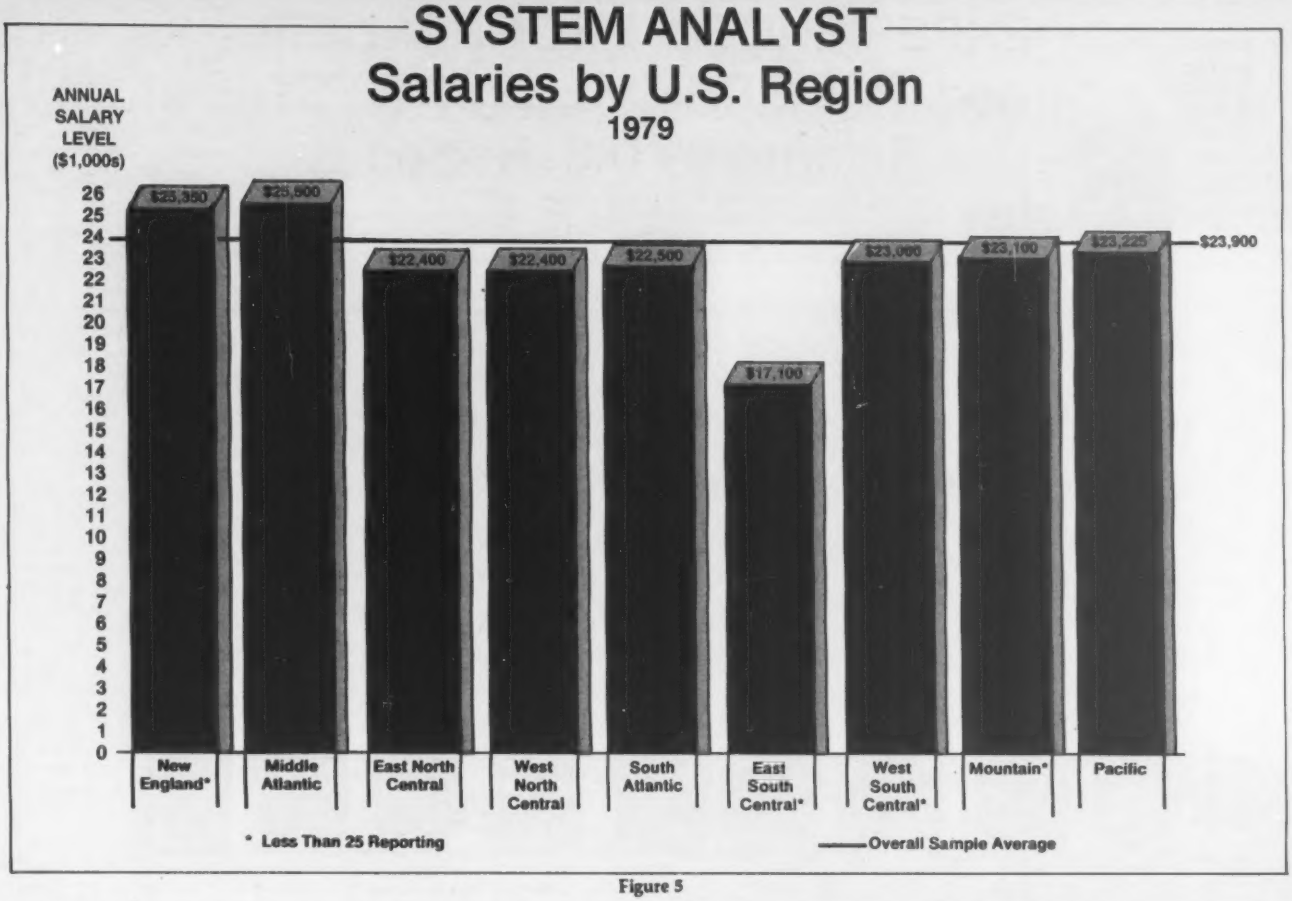

Figure 5

most 16% devote more than 50 hours per week to their jobs.

Where do these DPers work? Manufacturing companies employ the largest number (29.9%) of respondents; 12.8% work in software, planning, consulting or service bureaus; 10.5% work in financial, insurance or real estate firms; 9.2% in education, medicine or law; and 8.6% in the wholesale/retail trade industry and in government.

Industries that employ 8% or less of this population are public utilities, transportation, business services other than DP and communications services including printing and publishing.

Responses to other questions relating to CW readers' present work environment showed that most of their employers — about 54% — seldom if ever hire inexperienced people from outside the firm to train as programmers. This includes 21% that will promote people already working in other jobs in the organization.

Also, the majority (63.7%) of employing organizations train their programmers in-house, with only 15.7% relying on outside programming schools.

As for their own job preparation, CW readers rated college and manufacturers' training programs the most useful sources of training for their

(Continued on Page 14)

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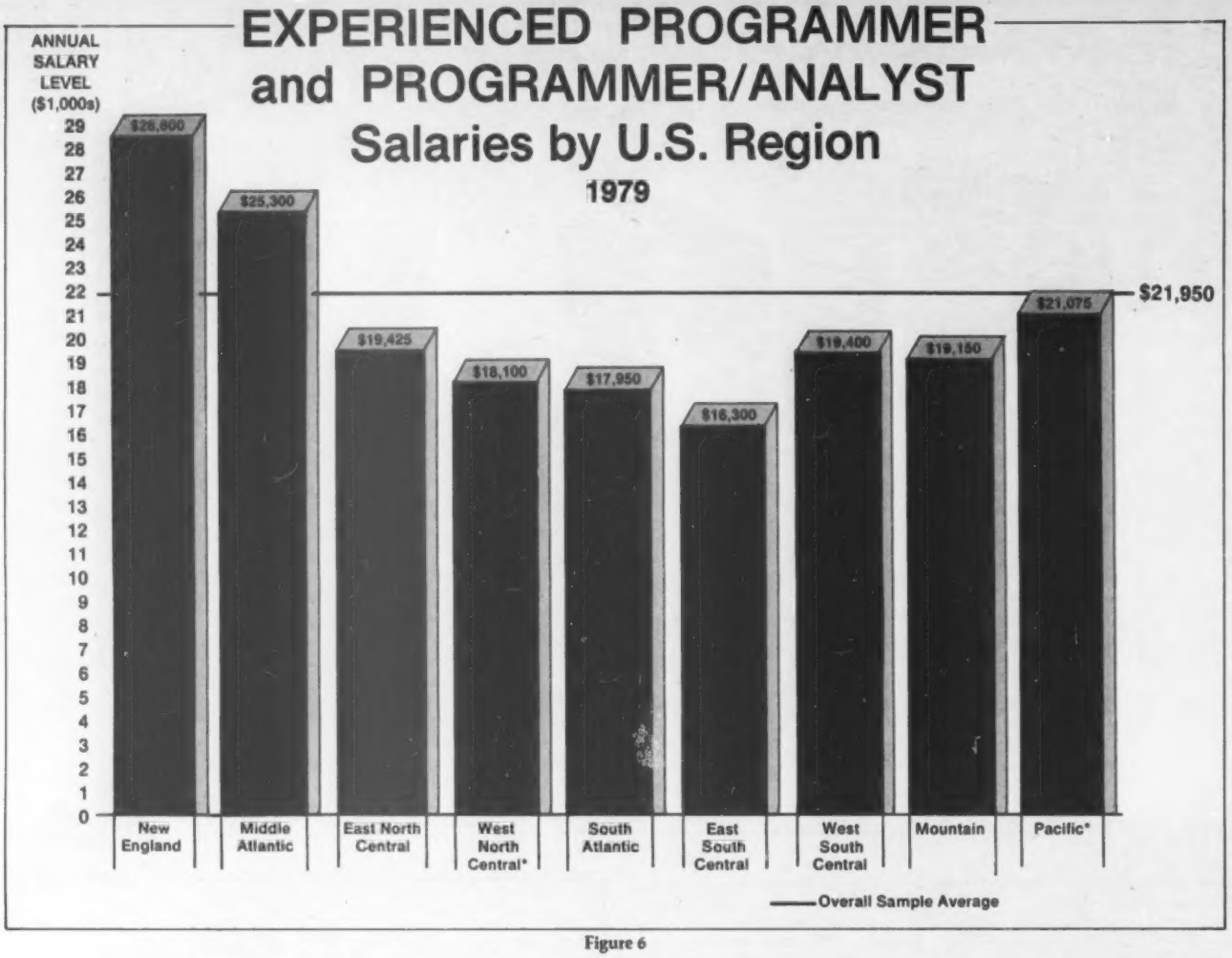

Figure 6

(Continued from Page 13)
present locations.

They found business and professional periodicals, independent professional DP personnel training courses and programmed instruction courses least useful.

Although this sample of DPers voiced their share of complaints about individual work situations, a whopping 83.9% see themselves working in DP five years from now. This number includes 25.4% who expect to move to a different part of the existing organization, 22.6% who plan to change employers and 9.7% who intend to remain in their current job.

And if they had it to do over again, an overwhelming majority — 86.7% — would choose the same career.

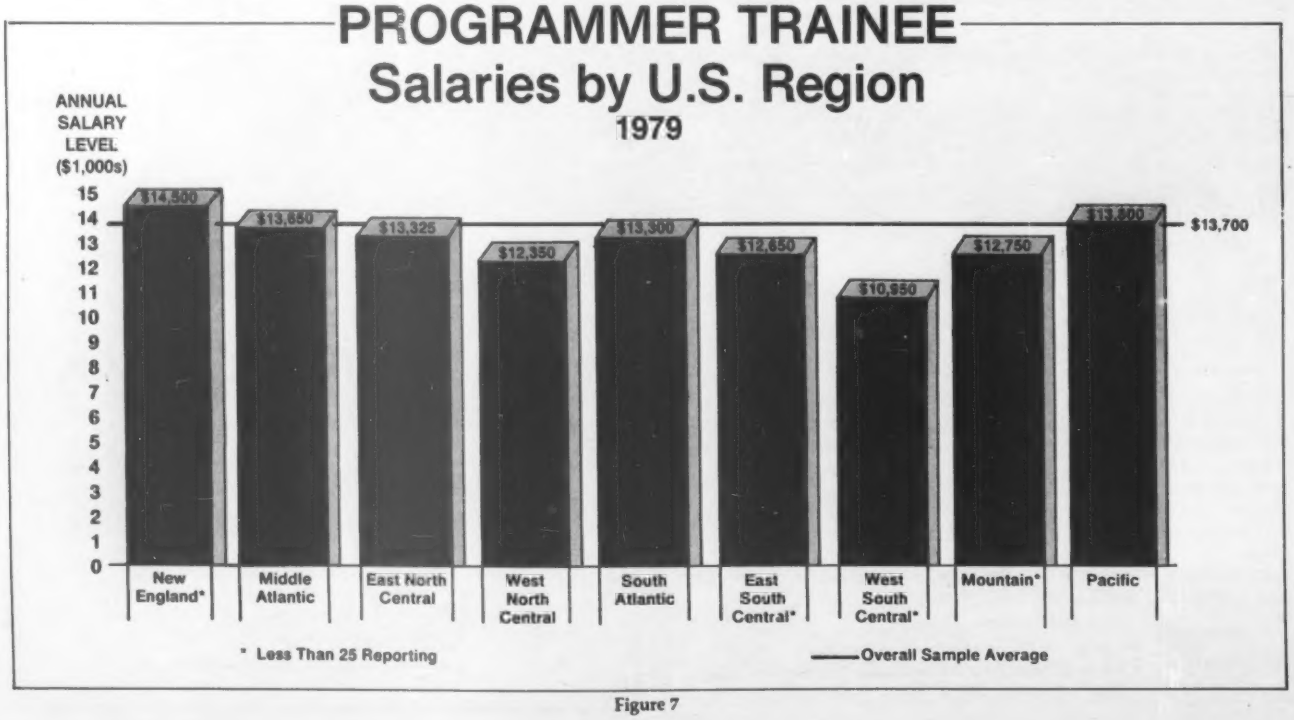

Figure 7

Although Personnel Shortage Still Exists

Employers Not Filling Telecommunications Jobs

By Ann Dooley
CW Staff

NEW YORK - The shortage of telecommunications personnel still exists, but employers are not hiring. Faced by energy, inflation and recession concerns, the employers are waiting to see what happens with the economy, a survey by Personnel Resources International, Inc. here found.

But while demand for telecommunications personnel has slowed, their salaries last year remained uniformly high throughout the country, continuing the upward trend of the past few years, according to the telecommunications placement service.

"In the first months of 1979, we saw unprecedented employment activity in this industry," Jay Jacobson, Personnel Resources president, noted. A record number of communications analyst and manager jobs opened during the first half of the year as employers looked for applicants with knowledge of advanced network, switching and traffic systems and state-of-the-art voice and data hardware.

By mid-1979, however, fears about the economy began to affect hiring, Jacobson said. Energy, inflation and recession worries all contributed to a decline in the usual growth rate.

Other Reasons

The telecommunications specialist indicated that the continued upward climb of interest rates also added to the hiring slowdown by causing previously high-growth firms to postpone the purchase of high-ticket items, thus decreasing the need for new hires.

Moreover, the firms that are first affected by a recession, such as those in the automobile industry, have not been hiring telecommunications analysts and related personnel, Jacobson stated.

But, he noted, few if any layoffs occurred.

No Unemployment

Although economic problems are making an impact on the industry, unemployment is still almost nonexistent, Jacobson noted. Applicants throughout the telecommunications field, except those in the upper salary brackets, can find jobs with ease, he said.

Job hopping has begun to subside, he added. Firms involved with buying and selling homes for personnel who relocate for new positions are running into trouble because of the mortgage crunch. While that problem does not arise if a job switch occurs within the same city or area, people are hesitant to move to certain parts of the country — or even to move at all, he said.

While it is not yet of real significance, Jacobson believes the trend toward mergers and acquisitions within the industry will lead to fewer potential sources for employment.

Industry Salaries

Industry salaries continued to increase. While they did not appear to have met the inflation rate, they did go higher than the increases suggested by federal government guidelines.

The 1979 salaries for DP operations managers — who Jacobson explained are responsible for the day-to-day supervision of computer operators and telecommunications operations — ranged between $21,600 and $25,700, according to the survey. Salaries for senior programmers of telecommunications systems ranged between $19,900 and $25,400, while programmer/message switching personnel earned between $16,600 and $20,500.

Ranges generally represented the mid-50% of collected data, thereby eliminating any extreme highs or lows.

Salaries for New York City telecommunication employees tended to be the highest in the country, averaging $1,000 to $2,000 above the national average for most positions.

Critical Shortages

Those job categories still experiencing critical shortages of personnel included hardware/circuit design engineers, radio and data technicians and data user telecommunications analysts. Employees with knowledge of advanced techniques were particularly high in demand.

The bulk of the jobs remained in the Northeast and Midwest, although some firms moved to the Sun Belt, Jacobson noted. Job openings relating to energy, both here and overseas, rose in 1979 and opportunities with oil and power companies and with firms supplying services or telecommunications equipment to those companies became plentiful, the survey found.

Specialized common carriers and satellite operations ran large-scale recruitment programs which are expected to continue throughout 1980, according to Jacobson.

The survey data was taken from recent applications and placements by Personnel Resources of employees working in various telecommunications jobs and spanned numerous industries all around the country. More information about the survey is available from Personnel Resources at Suite 1234, 342 Madison Ave., New York, N.Y. 10017.

Study Finds 20% Turnover Among DP Managers in '79

By Tim Scannell
CW Staff

PHOENIX — About one out of five DP managers in medium- to large-scale public and private computer installations across the country changed jobs or were replaced last year.

Further, approximately 25% of the 3,550 major computing sites in the U.S. — those with a Fortune ranking or with an annual budget of $250,000 or more — added, replaced or removed their mainframes, according to Applied Computer Research (ACR) here, publisher of the *Directory of Top Computer Executives.*

ACR found that the areas of greatest DP management turnover last year were banks and retail firms, accounting for 31% of the movement, followed by the federal government at 26%.

The largest chunk of industry, manufacturing, was right on the mean at 20%. The lowest rates of management turnover were recorded by the transportation and health services sectors.

Insurance companies and utilities made the most equipment changes, both with 37%. Close at their heels were banks and local government at 32% and transportation at 31%.

All the other representative industries were at or below the 20% mean level established by the survey. However, the two industry groups with the least amount of change were federal and state governments with 14% and 16%, respectively.

Vendor Loyalty High

As part of its study, ACR tried to count the number of vendor switches or companies abandoning one brand of computer for another and found vendor loyalty at an apparent all-time high. Approximately 5% of the companies polled dumped their present systems for another vendor's equipment or supplemented their computer with another vendor's wares.

Education-related groups accounted for the most vendor-to-vendor shifting, while transportation recorded only roughly 1%.

Finally, of the more than 3,500 sites studied, 55 — about 1.5% — were dropped for various reasons, mainly corporate mergers, centralization or abandonment of the DP function, ACR noted.

More details on the study are available from ACR at P.O. Box 9280, Phoenix, Ariz. 85068.

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Report Condemns N.Y. DP Vocational Training

By Tim Scannell
CW Staff

NEW YORK — Scores of students currently enrolled in computer vocational education schools and courses throughout the state are learning the DP trade on outdated or inadequate equipment and being taught computer languages rarely used by the business community, according to a report issued recently by New York's Consumer Protection Board (CPB).

In addition, of the 230 educational programs offered by these schools, only 25 of them contain material considered by the Board to be up-to-date enough for entry-level operations or programming students.

Only nine of the more than 100 schools polled were rated by the CPB as capable of providing modern, comprehensive and in-depth training for programmers, all of them located at community colleges.

Designed to be a shopper's guide to the state's vocational DP schools, "Check It Out" details the curricula, tuition policies, hardware and placement claims of 118 public and private institutions.

Funded by a $76,000 grant from the U.S. Office of Consumers' Education, the study looks at the various DP job categories, offers points on judging a school's quality and even suggests questions that should be asked when a prospective student visits a vocational school.

Presently, there are approximately 24,000 students enrolled in vocational classes throughout New York state, although only about 3,000 new and replacement jobs become available here each year, according to State Department of Labor figures.

Obsolete Machines

Among the facts uncovered by the report are that a good number of the state's schools use "very small" IBM 360 mainframes, limited-capacity minicomputers and a variety of obsolete electronic accounting machines to teach DP techniques.

For instance, a lot of schools rely on the IBM System/3 for student training because years ago it was the most widely used minicomputer, the report claimed.

However, even though many of these machines utilize modern data entry methods, the earlier models 6 and 10 used mostly keypunch cards for input, which could be a handicap to students in today's CRT terminal-oriented business world.

Course Cramming

In addition, quite a few schools try to cram "everything from data entry to operating and programming into one course," according to Lawrence Kramer, a CPB consultant and director of the first-of-its-kind study.

For example, one school, the Genesee-Wyoming in Batavia, N.Y., combines operator and programmer training in one 440-hour course. The course "includes 105 hours of keypunch, of little value to either operators or programmers, and 10 hours of obsolete EAM instruction," the report said. Furthermore, "100 of the 238 hours of [the course's] language instruction are spent on the very outdated RPG I."

Other outdated or rarely used computer languages taught by a number of schools in the survey include Cobol D, Cobol F and Fortran II.

Suggested Curriculum

By contrast, a minimum core curriculum for a two-year course in programming should have an introductory session covering terminology, number systems, flowcharts and operating systems; two semesters of Cobol; two semesters of assembler language; a course in project management, operating systems, data bases or systems design; and related courses in business, accounting and math, the guide stated.

CPB researchers also uncovered the fact that a few schools were submitting blatantly different placement figures to different state and local agencies. For instance, the New York School of Computer Technology, a proprietary or private profit-making institution, filed placement claims for 1975-1977 with CPB, the Bureau of Veterans Education and the State Education Department, and their figures varied from 10% to 36%.

Director Kramer noted that all of the basic information in the directory was supplied by the schools themselves, most of which cooperated fully with the two-part survey questionnaire sent out by the CPB.

Incomplete Responses

However, 10 schools refused to take part in the study or release any information on their scholastic activities, despite a letter sent to all the schools from the State Commissioner of Education urging compliance. All of the schools that refused to go along with the study were proprietary, Kramer pointed out.

Finally, the report warned prospective students not to be too impressed by a particular school's claim that it is registered, accredited or approved by various organizations.

Most of these accreditation agencies devote more of their time to protecting the schools from public scrutiny and criticism than taking strong action based on a student's complaint, the CPB said.

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After 14 Years and $1 Billion

Pentagon Yet to Create Workable Military Net

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — Pentagon efforts to develop a network of computer and communications facilities to link and control military activities around the world have yet to produce a satisfactory system after 14 years of trying and the expenditure of $1 billion, Congress was told recently.

The subject of regular and exhaustive investigation by various federal agencies, the World Wide Military Command and Control System (WWMCCS) has once again been scrutinized and found wanting, by the General Accounting Office (GAO).

In what has become something of a yearly ritual, GAO, at the request of the House Armed Services Committee, recently looked into the DP portion of the WWMCCS (pronounced "Wimex") program and reported that "there has been little if any improvement realized by the [Defense] Department since the program's inception."

Although the Pentagon is requesting more than $140 million a year for the computer and communications part of the system alone, "GAO's evaluation of the WWMCCS automated data processing (ADP) program showed that its objectives are yet to be achieved, although the Department of Defense has spent about $1 billion for this purpose since the start of the program," the report stated.

Described as "essential elements of U.S. national security," WWMCCS and its main component, the National Military Command System, constitute a complex arrangement of personnel, procedures and equipment for planning, directing, coordinating and controlling the activities of U.S. military forces. GAO estimated that the overall program has already consumed between $10 billion and $15 billion.

Workable Configuration

WWMCCS development is by any measure a formidable task. But the DP and communications components of the system, despite being "an essential resource that can enable WWMCCS to achieve its intended purpose," have yet to be meshed into a workable configuration, GAO said.

The task before the Pentagon, while staggering in scope, is simply stated: "the equipment must be compatible, communication links must provide a direct connection or real-time relay whenever necessary, computerized data formats must be common and all components of the system configuration and operation must be as efficent as possible in terms of both effectiveness and in the utilization of resources."

To that end, the Defense Department is trying to pull together a network based on Honeywell, Inc. 6000 series mainframes, which the GAO found to be inadequate for the task. The hardware, the report said, is unreliable, unsuited to this kind of network and not flexible enough for the various tasks required for WWMCCS.

In addition, the Honeywell-provided operating system, data base management and applications software do not support the command and control environment envisioned by the WWMCCS developers.

The system, as currently configured, does not and cannot provide the multilevel security necessary for military operations, and the equipment is not installed in survivable facilities, the GAO report continued.

While not writing off the WWMCCS DP undertaking as a hopeless boondoggle, GAO did conclude that throwing some $140 million a year at the program will not solve its problems. The report recommended "that the Secretary of Defense make certain that one central organization is given project management authority and responsibility for all WWMCCS and WWMCCS-related computer-based information systems."

Noting the several dozen reports produced over the last decade pointing out the continuing problems of WWMCCS development, this latest GAO review recommended Congress resort to big-stick tactics to get the Pentagon planners in line.

Congress should withhold funds for the WWMCCS computer network until the Defense Department determines the information needed by the various commands to support their operations, GAO said, and should withhold funds to upgrade the present computer equipment until plans are completed for a new configuration.

GAO also complained it had difficulty obtaining from the Pentagon information on how well WWMCCS is working now. Although Defense officials claimed the system was instrumental in U.S. operations to free the U.S. merchant ship Mayaguez, captured by the Cambodians in 1975 [CW, Aug. 14, 1978], the auditing agency was denied complete access to the crisis report on the incident.

Not even a letter from Rep. Richard Ichord (D.-Mo.), chairman of the House Armed Services Subcommittee on Research and Development, could pry from the Defense Department some of the documents the GAO considered essential for the Congress to "properly fulfill its oversight responsibility" for WWMCCS, the report said.

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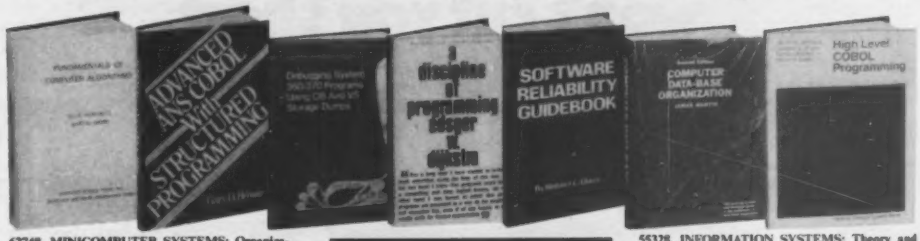
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Council of Europe Nearing Completion of Treaty

By Dr. Frits Hondius
Special to CW

STRASBOURG, France — A draft international treaty on computers and privacy sponsored by the Council of Europe here is expected to be ready for signature and ratification in the near future and well before 1984 — the infamous year of George Orwell's "Big Brother."

The preparatory work for this draft, "Convention for the Protection of Individuals With Regard to Automatic Processing of Personal Data," began in November 1976. It was drawn up by a committee of experts on data protection, chaired successively by Louis Joinet of France and Roy Harrington, UK.

The draft is now being examined by the Council of Europe's steering committee in the legal field, known as CDCJ. The plenary discussion on the text is scheduled for June 23 to 27.

In preparation for that meeting, a working party of the CDCJ has started examining the text. Upon approval by the CDCJ, the text will be submitted for adoption to the Council of Europe's decision-making body, the Committee of Ministers.

Apart from the 21 European countries that make up the Council of Europe (the European Economic Community [EEC] nine, plus 12 others), five nonmember countries have followed the negotiations as observers: Australia, Canada, Finland, Japan and the U.S.

The new treaty traces its origin to the 1950 European Human Rights Convention, which offers international safeguards for the protection of fundamental freedoms. The new data protection convention offers detailed solutions for the way in which two rights set out in the Human Rights Convention, namely, freedom of information and privacy protection, can be applied and be reconciled with each other where data processing is concerned.

The first steps were taken by the Council of Europe's Committee of Ministers, which recommended in 1973 and 1974 to member governments a certain number of principles on data protection. Seven member countries — Austria, Denmark, France, Germany, Luxembourg, Norway and Sweden — have enacted data protection laws based on these principles.

Several other countries, including Belgium, Italy, Holland, Switzerland and the UK, are expected to follow soon. The purpose of these laws is to ensure the protection of every person's rights and interests vis-a-vis automated data files.

Basic Philosophy

The countries on either side of the Atlantic share the same basic philosophy with regard to computers and civil liberties. If there are differences in their legal approach to this question, these concern only the method, not the objectives.

The three major differences between the legislative approach in Europe and that recommended by the U.S. Privacy Protection Study Commission are the following:

First, most European countries prefer omnibus rather than sector laws. Apart from the practical difficulty of how to classify categories of information, it is felt in Europe that the same general rules should apply to all records. The fact that information should be correct and not misused holds true for police records as well as medical data banks. Differences can be allowed for in the implementation rather than in governing principles.

Secondly, European laws protect not only the right to privacy, but also other human rights — for example, the right to fair terms of contract or to equal employment opportunity. Consequently, none of the European laws carries the word "privacy" in its title. The French law is entitled "Act on Data Processing, Data Files and Individual Liberties," and Germany and Austria have Data Protection (*Datenschutz*) laws. The latter term, although slightly ambiguous, has been adopted by Europe as a whole.

Thirdly, Europeans do not share the Americans' mistrust of supervisory authorities. As data subjects are by definition the weaker party in relation to users, it is felt in Europe that the protection of their rights should be reinforced by an independent supervisory authority. This authority should also have the confidence of the users and should counsel them on compliance.

International Laws

The emergence of national data protection laws in the 1970s will be expanded in the 1980s by the adoption of rules of international law. The need for such international rules is engendered by both the rapid growth of international computer networks and more generally by the growth of transborder movements of people, goods and services.

Transborder data flows between countries having different standards of data protection tend to weaken the level of protection in countries having the higher standards. Protective controls that such countries attempt to apply at their borders, as under the Swedish, Austrian and French Acts, can be neither effective in checking abuse nor easy to reconcile with the recognized principles of free flow of information and freedom of trade between nations.

The Council of Europe's committee of experts on data protection has first considered the possibility of resolving these problems on the basis of reci-

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OTHER INCOME, NET	10,873	16,810	20,787	13,085	12,956
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On International Data Protection and Privacy

procity. Each country would afford to citizens of other countries a level of data protection as prescribed by the laws of those other countries. The solution was found to be both unworkable and fundamentally unacceptable. Basic rights should be the same for all persons, regardless of nationality and residence.

'Common Core' Principles

The committee therefore opted for another solution. The convention should embody a corpus of fundamental principles on data protection common to all contracting parties. These principles, the "common core," place obligations on the users and confer rights to the data subjects.

Users should ensure correctness, fairness and security when handling personal information. Data subjects should be allowed to know and, where necessary, to challenge the information stored about them.

Special provisions will be included in the convention to help data subjects in one country to exercise their rights with regard to data files in another country.

The draftsmen of the convention have encountered two particularly thorny problems. The first is a veritable legal puzzle: if an automated data file in country A, owned by a company in country B, processes information on a data subject in country C, whose law applies?

Having weighed the technological and legal complexities, the committee decided to refer the study of this question to a consultant. In order not to delay unduly the convention's enactment, the committee also proposed that, if necessary, the rules on applicable law can be added later in the form of a protocol.

The second problem concerns transborder data flows between countries having a different level of data protection. The general rule should be no barriers between contracting parties.

Non-European Participants

The new convention is open primarily to European countries, but it can also be adhered to by non-European countries. The text has been elaborated in close cooperation with the Organization for Economic Cooperation and Development (OECD), which includes not only Western Europe but also North America, New Zealand and Japan. The OECD has recommended to its member countries policy guidelines based on the same principles as the Council of Europe's draft convention.

The terms of the convention leave open the possibility for a country to adhere to the convention for only certain categories of data files. Thus, for example, the U.S. might become a party to it for record where federal legislation is intended, such as in the field of health.

Some concern has been expressed in the U.S. about the convention's proposal to extend the privacy safeguards to groups, such as commercial companies. Would this mean that one corporation, under the guise of exercising its right of *habeas data*, could snoop into the records of its competitors?

It should first be pointed out that in Europe, corporate entities enjoy protection of human rights. It is very often through such bodies that individuals realize their rights – freedom of the press, of religion or of assembly.

But it should also be pointed out that both national laws and the draft convention permit restrictions on the exercise of data protection rights where this is necessary for the protection of the rights and freedoms of others, which includes the legitimate interests of the business community.

Data protection laws will inevitably cause some inconvenience to international trade. However, it would be absurd to pretend that erecting trade barriers is the very purpose of the convention. The American Federation of Information Processing Societies has quite aptly remarked that one may think up less cumbersome ways of hindering international commerce.

Where data protection laws cause some inconvenience, they affect domestic and foreign parties alike. It should always be kept in mind that data protection is for the defense of human rights.

With respect to the convention, a special role is reserved for the EEC. In May 1979, the European Parliament asked the EEC commission to take steps within the Common Market for data protection and even to set up a community supervisory authority. The commission has wisely replied, through Commissioner Davignon, that it prefers to await the conclusion of the Council of Europe's convention, to which the EEC can then become a party for matters under its competence.

Hondius is head of the Division of Public Law, Legal Directorate of the Council of Europe. The opinions expressed are those of the author, not the Council of Europe.

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'Illiteracy' Threatens U.S. Future Growth

Educator Calls DP Ignorance a National Crisis

By Jeffry Beeler
CW West Coast Bureau

BERKELEY, Calif. — Computing plays such a crucial role in everyday life that the general public's nearly total ignorance of the subject constitutes a national crisis, according to a University of California specialist in DP education.

In a modern technological society, the ability to use computers and understand their operation is as basic and necessary as reading, writing and arithmetic, asserted Dr. Arthur Luehrmann, associate director of the university's Lawrence Hall of Science here.

"Computers provide a powerful new intellectual tool for thinking about and solving real-world problems," Luehrmann said last week during a telephone interview. "Almost any job anyone could imagine can be done better and faster with the help of computers, and people who know how to use them have a tremendous advantage over those who don't."

Yet, despite computing's critical importance in the modern world, the vast majority of the U.S. general public knows practically nothing about a processor's workings and capabilities. Such DP "illiteracy" constitutes the leading threat to computing's continued growth in applications and public acceptance, the University of California official said.

Like Printing Press

Luehrmann, whose telephone remarks closely paralleled the text of a speech he gave last month at a local chapter meeting of the Association for Computing Machinery, likened the public's widespread ignorance of DP to a similar problem that followed the invention of the printing press around 1450.

Although the emergence of the printing press proved a significant technological development, its full implications remained unappreciated for about four centuries. Today, a similar plight reportedly faces computing, which Luehrmann described as a potentially revolutionary field whose impact on the man and woman on the street has only begun to be felt.

Part of the solution to the U.S. DP illiteracy crisis lies in establishing formal computer education programs in public schools. "Computing literacy is not hard to teach," Luehrmann said. "In fact, it's a lot easier than trying to teach someome how to speak a natural language,"

Nor does DP education in the public schools entail a huge investment. "I've often said that if a school can teach typing, it can teach computing," he said. "Today, the hardware costs are about the same."

Curriculum Needed

The most serious obstacle to the creation of computer education courses in the public schools is said to be the absence of a sound DP curriculum model that instructors can use as a guide in implementing their own courses of study. The development of such a curriculum model deserves much greater federal attention than it currently enjoys, according to Luehrmann.

"I think we have an urgent national need for federal funds to develop curricula that will teach school children how to use computers to solve real-world problems," he said.

Another possible solution to the DP illiteracy problem lies in the creation of continuing educations programs for working adults who have already finished their formal schooling. The most likely way of providing this continuing education is through university extension programs, Luehrmann said.

Many such programs already exist, he added, but most are relatively technical in their content, with engineers and scientists reportedly accounting for the bulk of the enrollments.

Calendar

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Feb. 25-28, San Francisco — **Compon Spring'80,** sponsored by the Institute of Electronic and Electrical Engineers. Contact: Compon '80, P.O. Box 639, Silver Spring, Md. 20901.

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Feb. 26-28, New York — **International Word Processing Association Symposium.** Contact: Word Processing Symposium, 2360 Maryland Road, Willow Grove, Pa. 19090.

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EDITORIAL

FAA Foot-Dragging Again

The midair collision between a commuter jet and a student-piloted aircraft over San Diego in September 1978, which claimed 144 lives, could have been avoided by the use of Litchford Electronics, Inc./Megadata Corp's microcomputer-based airborne collision avoidance system (CAS) [CW, Jan. 14] according to congressional testimony by its developers.

After six years' work on the system under a Litchford-Federal Aviation Administration (FAA) contract and just three months before the fatal crash, the FAA canceled the contract and scrapped the whole project — preferring to focus exclusively on its own ground-based CAS, implementable in 15 to 20 years.

Besides scrapping the airborne CAS — which utilizes existing altitude-reporting transponders and which its designers claim is implementable within only three years — the FAA has repeatedly ignored requests from air traffic controllers for back-up ground computer systems to again reduce the probability of midair collisions [CW, Nov. 12, Nov. 26, Dec. 3, Dec. 10]

Meanwhile, the number of reported near midair collisions in U.S. airspace almost doubled between 1974 to 1978 — from 286 to 503, according to the FAA's own statistics. In the first eight months of 1979, alone, there were 345 near midair collisions reported by pilots to the FAA.

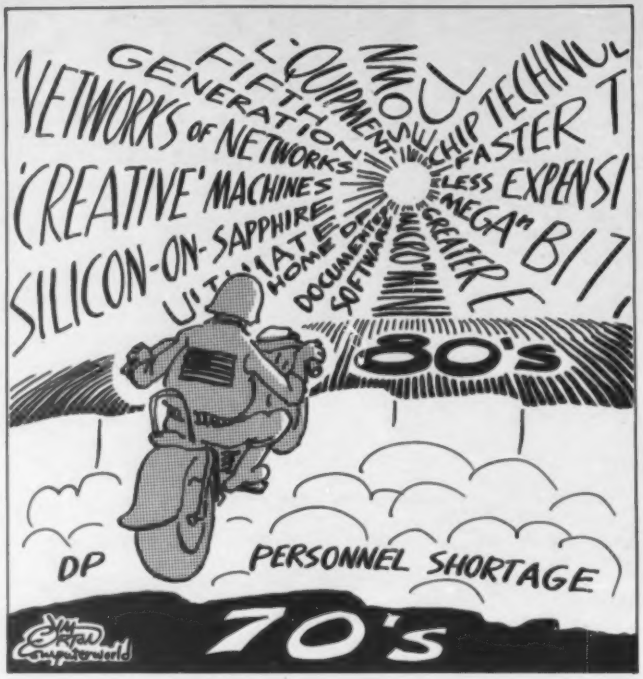
And as recently as Jan. 8, there was another near midair collision over San Diego between an American Airlines jet and a Navy helicopter. That incident came 2-1/2 weeks after the National Transportation Safety Board urged emergency federal action to tighten air traffic control in San Diego to avoid another catastrophic collision.

The board — an independent agency whose recommendations are not binding — also urged that all aircraft using San Diego airspace be equipped with altitude-reporting transponders, the basis of the Litchford CAS.

Besides giving pilots more control of their own destiny, the airborne CAS would relieve ground controllers' work loads, increase ATC system capacity and reduce communications congestion, according to an independent report of the American Institute of Aeronautics and Astronautics.

As a direct result of the FAA's characteristic foot-dragging on the airborne CAS, research on the Litchford project has been transferred to the National Aeronautics and Space Administration (Nasa) through a congressional mandate [CW, Jan. 14].

This system should now receive the attention it deserves, freed from the constraints it faced in the prejudiced environment of the FAA.



DATA PAST

Five Years Ago
Jan. 15, 1975

ATLANTA — Small businesses with no prior experience in data processing were expected to be the initial users of the IBM System/32 announced here. But its communications facilities suggested the "fully integrated" package might also be used by larger organizations as terminals or satellite processing devices.

With the announcement of the System/32, IBM finally put all the hardware "under the hood." The entire unit — CPU, memory, keyboard, display, printer, disk storage and diskette station — was integrated into one desk-sized package and a change in any one component called for a completely new package.

— — —

CONCORD, N.H. — A suit filed here by Sanders Associates claimed that IBM's marketing forces used the firm's control over compatibility and standards in order to "coerce" users into acquiring complete systems from IBM. The suit, which charged IBM with monopolization of the general computer market and the CRT terminal market, sought damages of $225 million.

Eight Years Ago
Jan. 12, 1972

WASHINGTON, D.C. — A battle was shaping up between the Federal Bureau of Investigation (FBI) and agencies on the state and local levels over the control and management of police systems tied into the FBI's National Criminal History System data bank. "Hundreds" of individual localities complained that new FBI security regulations only led to waste, with no security improvements.

LETTERS

Debate on Structure

I have just read John A. Moccabee's letter [CW, Dec. 24] wherein he stated, "To my total amazement, the topic (structural programming) is now up for debate and conjecture abounds." Indeed, Moccabee must be well out of the mainstream of data processing if he believes that "structural programming" has ever been accepted without great reservation by experienced Cobol applications programmers.

Perhaps Moccabee has never had to write business application programs in languages such as SPS, Autocoder, Basic and Fortran. I have, and consequently have a great deal of appreciation for Cobol, including the GOTO and GOTO DEPENDING ON statements, which I consider to be among the more powerful of that language's capabilities.

I agree with Moccabee's comment that " . . . the design is the thing, not the coding standards." However, it is a matter of opinion whether "structural design" equates to good design.

Harold S. Hunt Jr.
Reston, Va.

Award Name Changed

The Data Processing Management Association (DPMA) is obliged to J. H. Tarrant for the interest in DPMA, expressed in the Dec. 24 issue, by suggesting a new name for our former annual Computer Sciences Man of the Year award. The name was changed to Distinguished Information Sciences award by the DPMA Executive Council last October, reflecting the consensus of DPMA membership; a story on the change appeared subsequently in *Computerworld*.

DPMA denies the implication that the former name was "sexist" as charged by Tarrant, since the word "man" was used in the generic sense; and it was in that sense that the award was enthusiastically accepted by two distinguished practitioners of the science, Capt. Grace Mary Hopper, the first recipient in 1969, and Dr. Ruth M. Davis, the most recent recipient in 1979.

Edward J. Palmer
DPMA Executive Director
Park Ridge, Ill.

Incredible Drivelings

The appropriate title for Michele Landon's commentary on software making analysts/programmers extinct [CW, DEC. 10] is "Incredible Drivelings from Little House on the Prairie." Experienced computer professionals have had to endure this recurring foolishness for quite some time.

My earliest recollection of this prophecy is circa 1970 when sundry software packages of marvelous repute were born (hatched?) Through the years each new offering was touted as a cure-all elixir for mankind's computing ills. However, as the dust cleared, each time more analysts/programmers were needed than ever before. A generalized package does not tailored and efficient software create.

I suggest that those advocating extinction band together to form a large neglected pool of common ignorance. This would allow the knowledgeable professional to easily avoid such quackmires and develop some good software.

Jeff Buchanan
Richland, Wash.

Computerworld welcomes comments from its readers. Preference will be given to typed, double-spaced letters of 150 words or less. Letters should be addressed to Editor, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

READER COMMENTARY/Robert H. Shullich

Anatomy Of a Load Module

Is the time required to load your load module degrading your on-line system? Does the overhead to perform a load request have any effect on on-line response time?

Many companies have turned to optimizing compilers to make on-line programs run faster and more efficiently. The design of the system as well as coding techniques play an important part in transaction process time. But even after the compilation is finished, there is still optimization that needs to be done with the program.

Some installations have recognized these needs and have tried to improve overhead by putting the program libraries on fast-access disk packs. But some load modules require many I/Os in order to satisfy a load request. What does a programmer really think is out on a Linklib and what is really there?

In one installation in the federal government, it was thought that a load module was program object code split into blocks the size of the tracks on the disk. This installation thought that if an IBM 3330 disk was used with a track size of 13,030 bytes, all programs under 13K would only require one I/O to read the program into core.

Based on this assumption, the standards set at this installation stated that all programs for on-line processing could not exceed 13K.

Some programmers believe the load module is in the same format as an object deck.

The format of a load module is unique under OS or OS/VS and does not represent either of the above formats. The most controllable record type on a load library is the text record.

This record can store up to the track size in object code, but only if the programmer specifies the proper parameters in his Linkedit. Then, even if a whole program could fit on one text record, it could take many records to represent the load module in the Linklib.

Every text record has a control record that precedes it, so every text record requires two reads. If the text records can be reduced through some optimization, two I/Os will be eliminated for every one text record optimized.

The IDR Records

A nice form of documentation is the Csect Identification records, known as the IDR records. They make it possible to see when the load module was linked, when it was zapped and when each Csect within the load module was compiled.

These IDR records cost the on-line system three extra I/Os per load. They are comments and are not required to actually process the load module.

If the module contains many subroutines, extra translator IDRs could be generated. This adds to the I/Os in processing the load module.

Most modules have address constants which have to be relocated. To relocate these addresses, an RLD block containing relocation information is written in the Linklib. These RLD blocks sometimes do not generate extra I/Os because they are combined with

(Continued on Page 27)

READER COMMENTARY/David E. Peters

Halon, Water Sprinklers Are Complementary

We at Dupont Co. would like to respond to "Halon May Not Be Best Protection," the Reader Commentary by Stanford L. Vogel [CW, Dec. 17].

The accidental flooding of the U.S. Census Bureau DP room [CW, Aug. 13] has raised concern regarding the appropriate method for protecting central DP rooms.

Some observers noted that the situation could have been avoided by using Halon 1301 protection [CW, Oct. 15]. Yet others referred to National Aeronautics and Space Administration and General Accounting Services positions, which discourage the use of Halon 1301 from essential electronic equipment operations in ground facilities mainly because of dangers to human life and safety [CW, Dec.17].

Rather than view water sprinklers and Halon 1301 as fire protection alternatives, we suggest that the systems are complementary. The Census Bureau situation points to the importance of proper selection, installation and maintenance of equipment to avoid accidental discharge, no matter what the agent.

Additionally, the Census Bureau incident points to the devastating effects water damage can have on property and equipment and, most importantly, the continuity of vital service independent of fire damage.

Rather than adopt an adversary position, we suggest the following:

- The use of Halon 1301 as a primary response method of dealing with the greatest risk, namely, a loss of service resulting from fire within the electronic equipment or DP area.
- The use of water sprinkler systems as a backup to the first system, recognizing that water damage will not be the major concern in the case of a highly unlikely conflagration.

Frequent budgetary restrictions preclude use of both systems in many installations. Halon 1301 as a primary fire suppression system, when used under the guidelines of the National Fire Protection Agency's 12A standard, can be immediately discharged safely into occupied areas and suppress a fire at concentrations that do not endanger occupants and before fire combustion products pose a health hazard.

Extensive toxicology and fire tests over the past 25 years have established these points beyond reasonable question.

In remote areas where backup fire companies cannot respond to a major disaster or in situations where a fire hazard exists outside the protected area, water systems should be considered for backup and should protect structures for which water sprinklers are best suited.

Peters is technical manager for Dupont Halon 1301, Dupont Co., Wilmington, Del.

HUMAN CONNECTION/Jack Stone

Are All Your User Jobs Really Necessary?

In spite of the enormous contribution of DPers to the operating health and welfare of industrial, commercial and government organizations, the general perception of most top executives is that the DP department (known also as "information systems," "data services" and so forth) have become unmanageable.

The bosses reach this conclusion, in some large measure, having tracked the meteoric growth in the backlog of systems development projects. For the larger organizations, this backlog — now characterized in terms of years rather than weeks or months, and still counting — has become an anathema of the first order and a subject of continual harangue in executive suites. It has been chosen by those in power as a symbol of poor DP performances — justified or not. Much can and should be done to alleviate this situation, beginning with the "global purge," the subject of this article, second in the current series "DP Management in the '80s".

My speculation — confirmed by more than a few DPers I know — is that perhaps 10% to 30% of the production jobs (and probably the development tasks as well) on general-purpose machines can and should be scrapped — and the planning, development, operational, maintenance, administrative and management resources necessary to support them should be applied to the backlog of significant jobs (or to other important needs).

And which jobs are the best candidates for being dropped? The technical purists would, of course, demand a new feasibility study, using the same standards that justified the application originally. One problem with this approach is that too many applications have been implemented without competent analyses. In addition, such studies would require the use of the same technical skills that are already in short supply.

This is the second article in a two-part series, "DP Management in the '80s."

Cost/Benefit Criteria

Another approach is to establish uniform, simplified cost/benefit criteria for the work load, taking account of all resources applied during the projected life of the job. The output of the effort is a "prioritizing" of development and production jobs, based on cost and benefit characteristics, which compares jobs from all user areas on a common, quasi-scientific, basis.

Even though the costs may wind up as the results of guesswork and the benefits have to be subjectively derived, this approach has considerable merit. It can be based, certainly initially, on technical judgments that do not require massive study efforts. After all, the objective of the exercise is not to label applications with a mark of absolute quality, but rather to help identify the jobs on the lowest rungs of the cost/benefit ladder and provide a basis for trade-off decisions, that is, dropping the lower rated jobs and reallocating resources to get selected development jobs going.

In other words, we use a "heuristic" strategy. Of course, those installations with comprehensive automatic job accounting systems are well ahead of the game.

But DPers seem to have been studiously avoiding the global purge like the plague, basically, I submit, for reasons of "politics" plus the likelihood of further lowering the coefficient of DPers' popularity. Everybody knows about the "pet" jobs important users have, jobs that have long before become prehistoric oddities. Such jobs do little more for the organization than gratify user egos but will cause strong protests from their sponsors if dropped out of the stream.

And then there are those users who don't want to admit that certain of their crisis needs were way overstated in the first place and will fight tooth and nail to keep an obsolete job running to avoid an embarrassing confrontation on the subject with top management. And, of course, there is that nagging question as to who is really responsible for purging jobs anyway (a subject that will be addressed as part of a larger issue of DP responsibility in future columns).

So, DPers have side-stepped the purge, believing that the allocation of a few hours of mainframe time here and there is a small price to pay for user eccentricities. But what's happened is that wasteful, unnecessary applications have proliferated and, when one totals all the resources that are needed to keep these jobs going, one determines in a hurry that archaic jobs have turned out to be an important factor contributing to an inoperative systems development backlog.

Letters to Stone should be addressed to him at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

THE TAYLOR REPORT/Alan Taylor

Texaco Error-Control System Falls Short

Computerworld reader James Morse of Grand Rapids, Mich., used his Shell credit card at an airport Texaco station on Oct. 10, 1974. On Aug. 17, 1979, a Sawyer Transport driver used his Texaco card at a Phillips 66 station in Evansville, Ind. The stage was then set for an examination of whether the Texaco billing system can cope in a modern manner with errors involving its computerized billing.

The results of the examination suggest that Texaco, like Woodward & Lothrop (whose story was reported here last week), is unnecessarily behind the times in its DP error control. And, also like Woodward & Lothrop, Texaco has been found to be using sloppy DP practices.

When Morse used his Shell card, Texaco set up a billing-only account and gave it a number starting with the digits 345. The Texaco Sawyer Transport number was almost the same, but it started with 543. The Texaco Modulo 10 check-digit system does not differentiate between the two, and both have check digits of seven! An error-prone situation was then lying in wait for one single transposition error.

The error occurred on Aug. 17, 1979 when a Sawyer card was used in a Phillips 66 imprinter on a Phillips 66 slip. The number was only partly printed, because of the different imprinter designs. Only the lower third can be seen — the rest is simply not there. Still, it went to Texaco rather than to Phillips and was thrown out by the optical character readers. The slip with the incomplete number was manually reviewed and was given the Morse number that had been lying dormant for years. The transaction was passed through the computerized check-digit system along with the number of cents involved (7383) and billed out to Morse.

Meanwhile, in Grand Rapids

Morse had moved in December 1976 and so the Grand Rapids Post Office returned the statement. Texaco remailed it (the company gets 20% to 30% success on such second mailings). Grand Rapids sent it back and the October mailing was opened by Texaco about Nov. 3 or 4. Someone this time took the trouble to read it and, realizing that Morse was not Sawyer Transport, canceled the debit.

However, by then the mailing of the November bill was on its way, also to be eventually returned from Grand Rapids.

This November set of returns made someone trace Morse through the Grand Rapids telephone system to his new home, and on Nov. 23 the new address was entered in the system. Both the October and November statements — claiming payment due on receipt — along with a letter from Jim A. Klaus, went to Grand Rapids.

On Dec. 7, a rather infuriated Morse wrote to Texaco.

Texaco's error-recovery systems contain at least two major deficiencies. The first is in the assumption that merely returning a rejected item to the mainstram of processing is acceptable. Normally, this is not, and certainly it was not in Texaco's case.

The difference between the mainstream and the reject-stream processing that Texaco overlooked is that the pure-number customer-identification system used in the mainstream process is simply not reliable except when the numbers are machine-derived, as they are in the case of mainstream processing. Here a number is properly affixed to an account by the use of a credit-card imprint, which is optically read.

Texaco, in fact, uses a special font, unlike those of the other gas companies and will be able to see that the accuracy here is adequate. But when the reject stream is reached, the same aspects do not hold.

Human-created numbers need better and different checks; and these should have been built in.

At the very least, when a faulty check-digit system is the only logical protection used, the first letters of the card holder should be included for error-control purposes.

The second major error in the Texaco error-control system is very similar to the Woodward & Lothrop error — incomplete compensating operations. In this case, making a credit notation on Nov. 4 left the Morse account different from what it would have been if there had been no error — and that was the real problem.

In fact, in modern DP error control, systems should compensate for all false or dangerous statements that are created as a result of an error.

In this type of circumstance, where false documents have been in circulation, halo-type error retrieval should be used. With halo error controls, not only would the retraction letter have been sent out to the old address, but any change in the Morse record, would have triggered a repeat of the retraction. It would also have ensured that any letter coming in from Morse would have been logged and answered directly even though there was no further need to update Texaco's files.

The system of halo control is so called because it places a halo around the affected record. Any time the record is referenced, the halo flag causes an examination of the reference to see whether news of the error has been received by the people involved.

The Texaco error-retrieval systems are far less complete than disciplined software can provide in the '80s.

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READER COMMENTARY/Jerome L. Dreyer

Computer Services: The Decade Ahead

The '70s simultaneously represented a growth and stabilization period for the computer services industry. Growth occurred in the number of available products and services, industry revenues and number of companies competing in the marketplace. In 1970, approximately 1,000 U.S. companies were marketing $2 billion in computer services annually. By the end of the decade, the industry was producing nearly $9 billion in annual domestic revenues generated by approximately 3,500 companies. The growth rate in the '70s for the computer services industry even exceeded the rate for computer hardware manufacturers!

Yet, even with the phenomenal expansion of the computer services industry, the '70s also represented a time of stabilization. The young industry became financially and managerially sound, as evidenced by increased investor confidence and acquisition of computer services firms from outside the industry, such as the recent Dun & Bradstreet acquisition of National CSS and McGraw-Hill's purchase of Data Resources.

Adapso's decade-end commentary was inadvertently omitted from the Dec. 31-Jan. 7 issue of Computerworld.

The '70s also showed the economic viability and adaptability of the computer services industry. The industry has survived and even prospered in recessionary times because it provides cost savings and complete problem-solving capabilities that have become necessities for business and government. The services companies have also been resourceful in utilizing improved and changing hardware technology to provide new and better services and products while keeping costs down.

A prime example of this adaptation is the services industry's response to the minicomputer. In the '70s, with the advent of the mini, many felt the time-sharing business was doomed. Instead, the industry seized the mini and made it an important component in an integrated program of services available to the customer. The mini has created a market for stand-alone turnkey systems, turnkey minis with time-sharing back-up systems and a fantastic demand for customized and packaged software.

However, the main reason for the unsurpassed growth of the computer services industry in the '70s was the premise behind the business — service. The industry is based on the concept that the computer should be a management tool providing functional, accurate and timely information to meet the specific needs of the user at an affordable cost. Most of all, the utilization of a computer should provide solutions, not create additional problems.

In short, the time-sharing, software products, professional services and original equipment manufacturers have made the computer easily accessible, created efficiency, cut costs and eliminated problems in a variety of ways.

However, the major accomplishment of the '70s was the services industry's ability to simplify the use of the computer, while the machine's capabilities became more complex and sophisticated. These efforts to remove the machine from a pedestal have made it an accessible and indispensable tool for individuals with no formal computer training.

On the Horizon

As the computer services industry races into the '80s, we see many continuing trends and positive changes on the horizon. An emerging confluence of technologies involving computers, telecommunications and data bases will broaden the scope and capability of computer services and products. The computer services industry of the '70s will grow to become the information products and services industry of the '80s, based on multiplication and diversification of technological advances.

As versatile terminals and common carrier networks become more widely available, a new generation of applications will arise. This, coupled with a steady increase in hardware and software products from the mainframe manufacturers and independent software companies, will provide additional flexibility. Computers and communications enhancements will provide the industry with better price/performance computing equipment and improved communication skills, resulting in continued expansion of the products and services market. We will continue to see an expansion of applications within the existing base of data processing users and the development of new uses of services in such emerging areas as electronic funds transfer systems and point-of-sale systems. Technological expansion will be heightened by new, lower cost terminals that permit easier access to remote computers; improved and lower cost data communications, which makes processing from geographically dispersed centers more feasible; and the availability of data processing and pro-

(Continued on Page 27)

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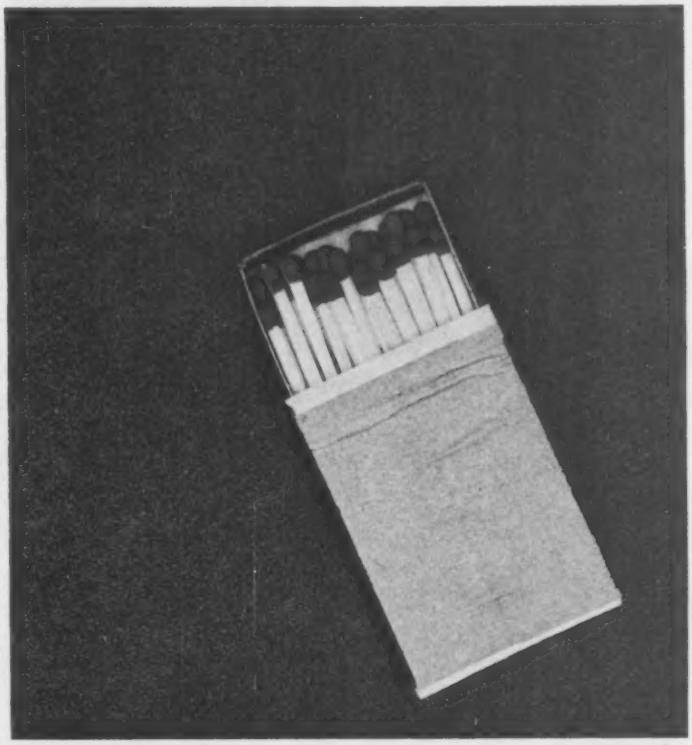

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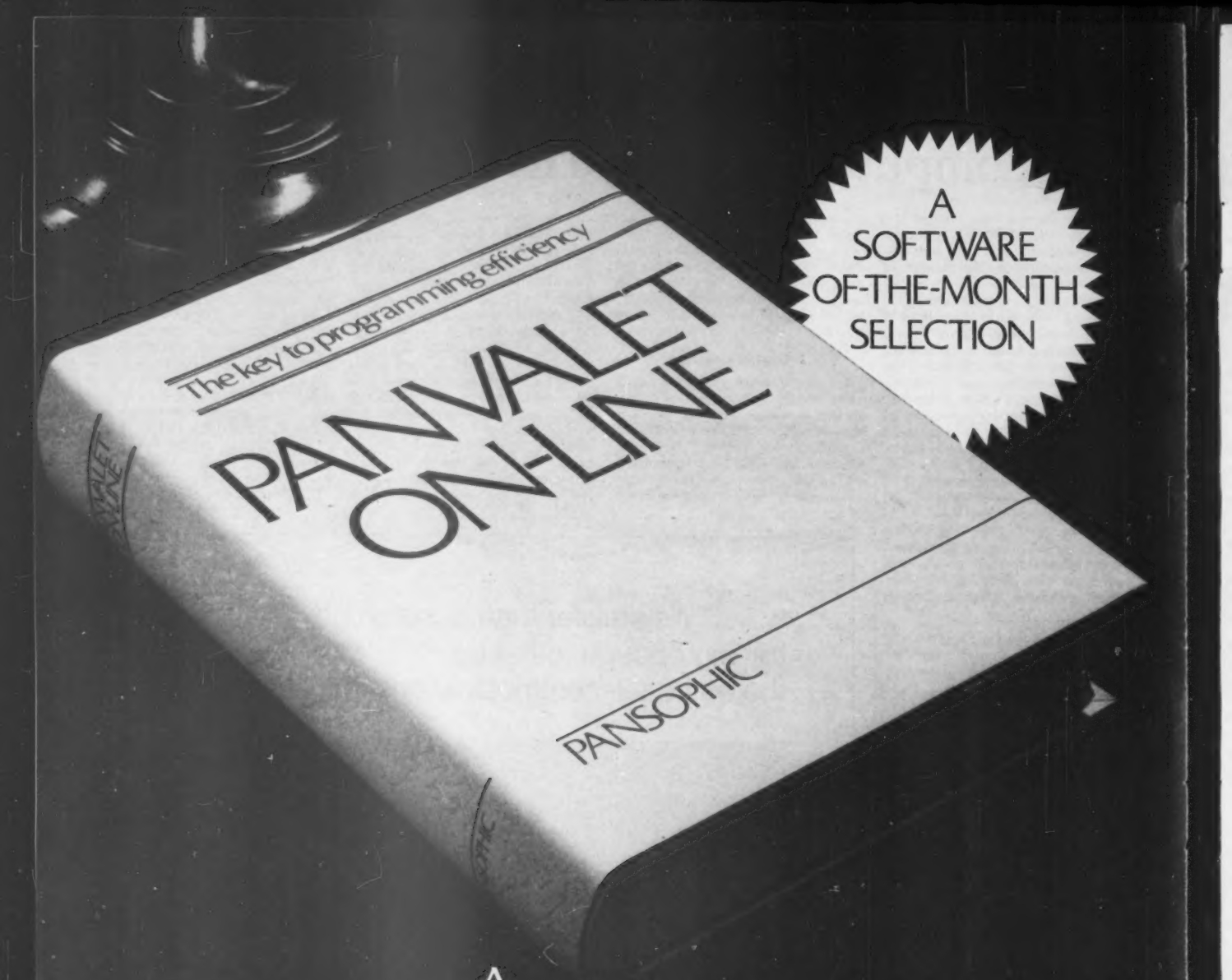

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Services Industry: Looking Ahead

(Continued from Page 25)

gram packages to a multiplicity of customers, thereby distributing development costs over a large user base.

The merging of communications and information technology will pave the way for more sophisticated and widely used international networks. The key to this area will be based on the success of the Association of Data Processing Service Organizations (Adapso) in its efforts to break down foreign trade barriers in the information products and services field.

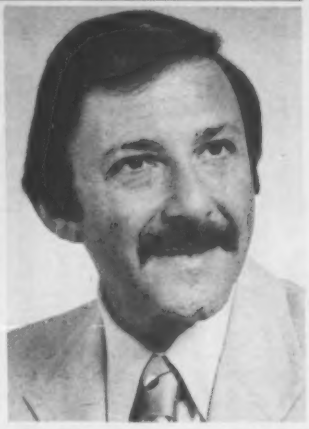
Annual Growth of 20%

In short, the U.S. information products and services industry will continue to grow at the rate of at least 20% annually and the industry will become as important a resource to U.S. and worldwide commerce as energy. It is clear that information processing capabilities will be necessary for a business to compete in the '80s.

With information technology playing an ever-increasing role in our jobs and personal lives, who will provide the information products and services we will need in the years ahead? In many ways, this continues to be an open question. It is Adapso's position that the public will be best served if a large number of independent information products and services companies continue to be involved in the industry. Yet, we cannot ignore the increased merger and acquisition activity, both in terms of consolidation and purchase by companies outside the information technology industry. Nor can we ignore the attempted entry of those who would have an unfair advantage in the marketplace with the ability to drive many independents out of business.

The information products and services industry has been built by small businessmen, with innovative ideas, developing new products and services. The influx of innovation is crucial to the future of the industry. Adapso will continue to give the highest priority to maintaining fair and open competition and will take all necessary and proper steps, including legal action, to protect the competitive environment.

We look forward to the '80s, knowing that our industry will continue to provide the public with solutions to the major problems of today — productivity, timeliness and cost effectiveness — in a society creating and using information at an ever-increasing rate.



Dreyer is executive vice-president of the Association of Data Processing Service Organizations, headquartered in Arlington, Va.

Anatomy Of a Module

(Continued from Page 23)

the text control records.

The external symbol dictionary (ESD) is written in 256-byte blocks containing 16 bytes per entry. If a program uses many external references, extra ESD blocks could be produced.

Some factors controlling the text records are the Linkedit parameters and the data set blocking factors. To get the best results, the block size of the Linklib should equal the track size of the disk where it resides. The selection process for disk residence should therefore consider track sizes as well as access speeds.

The SIZE parameter on the Linkedit procedure should be large enough to allow buffers large enough to be generated to handle the large block size. If not, the linkage editor will generate the largest block it can handle for the library.

Undesirable Option

The data communications option, which is the downward-compatible option, should be avoided. If it is used, all text blocks will be no larger than 1K byte. This option could have an adverse effect on program loading for large programs.

When coding an on-line program, thought should be applied to external modular programming where many external subroutines are used. If these subroutines will always be linked with the transaction processing program, then it may be more efficient to make them part of the transaction program.

This would be a case where MACRO, COPY or INCLUDE code would be used instead of external subroutines. This reduces external references and therefore reduces the ESD.

Even with the largest block size set and the proper parameters, the linkage editor will not always build an efficient load module. There may be need in the future for a linkage editor optimizer to reduce the size of load libraries and load modules to allow for a more efficient and speedier load of on-line transactions.

Shullich is a consultant for Informatics, Inc.'s Professional Services Division.

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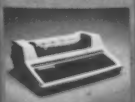

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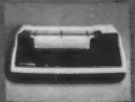

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READER COMMENTARY/James W. Lowrey Jr.

DP Faces People Crisis, Not Software Crisis

The reader commentary, "Software Crisis: Method or Psychology?" [CW, Oct. 29] struck home because I am a training manager. From that perspective, I can agree that education exists to alleviate personnel difficulties.

However, I feel those difficulties are the symptoms (at least partially) rather than the disease.

No matter how diligently a programmer or analyst is educated in the "proper" methods of applications or software development, no real lasting progress can be made without two critical items: effective leadership and effective standards/controls for systems development.

I know it sounds like one more person jumping on the "aren't DP managers turkeys?" bandwagon. To the contrary, they are one of the most maligned, least supported groups in DP. How can people who are given no preparation for a job be expected to perform adequately?

I stand in silent amazement at how it can be expected that these people are to manage people, produce systems and lead state-of-the-art technical experiments in the bargain. The fact that they perform as well as they do is remarkable.

If possible, senior DP management is the target of more cheap shots than lower level managers. Is that justified?

It depends on the point of view. Many of the senior DP managers were "developed" in the same slapdash manner that currently is still being used. The only difference is that senior managers had this "development" inflicted on them 10 to 15 years ago instead of recently.

What I'm saying is that there is a lot of work to do in developing effective management before the software crisis can come close to being adequately addressed.

'Systematic' the Key Word

Given that all this is even partially true, must we wait for the next generation of MBAs to lead us out of the leadership wilderness? No. Managers are not born, they are developed.

It is my contention that, given reasonable intelligence, anyone who really *wants* to can be an adequate manager, perhaps better than adequate. Provided, of course, that such a person is identified, systematically educated and put into supervisory and/or management situations in a timely manner.

The key is the word "systematically." First, what is expected of a manager? Once this is defined, the education programs are there to be used.

All too often, the developing manager gets pulled out of an educational program because of "higher priority tasks." I wonder how many system development projects get half-vast results because of half-vast development of their leadership?

The second item, necessary to end the software crisis, effective standards/controls for system development, applies to systematic use of all the tools we have for system development. We can have the best tools in the world, but if they aren't systematically used, they are not effective.

So far, no methodology has demonstrated universal applicability in systems development. Perhaps (gasp!) a universal methodology will never be developed. However, an intelligent synthesis of several methods properly applied during the system development cycle may be the answer.

Paul Anagnostapoulos and I are, in many ways, saying the same things. However, I feel that we have a people crisis, not a software crisis. Systems are developed by people using tools, not by the tools themselves.

Lowrey is manager of education and human resource development for Crocker National Bank's Computer Systems Development effort in San Francisco.

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Trio Supports DOS/VS and VSE Sites

FAIRFIELD, N.J. — Macro 4, Inc. has introduced a trio of products covering IBM DOS/VS and DOS/VSE procedure library and console reader support, job accounting and dump formatting in the event of abnormal terminations.

Power-Plus is a family of programs offering "significant enhancements" to IBM's Power/-VS, the firm said. Procedure library support with multilevel nested procedures and procedure expansion at execution or spool-in time is just one of its capabilities, according to a spokesman.

This package also allows the console to be used as a Power/VS reader. Retrieved procedures and "held" Power/VS jobs may be inspected and modified prior to execution, he noted.

In addition, compatibility and conversion features — including autogeneration of Power/VS JECL; transparent handling of executed Lineup, Punchup and Graspctl; and support for device Equates — can be provided to help users of GraspVS from Software Design, Inc. make an "effortless transition" to Power/-VS.

The Power-Plus procedure library support costs $100/mo, the execution time procedure aid costs an additional $25/mo and the compatibility and conversion support costs another $75/mo.

Enhanced Accounting

Macro 4's second introduction, the system accounting package, produces job and step accounting data, including performance measurements. This software supplements DOS/VS and Power/VS data-gathering routines to make available data that is usu-

(Continued on Page 32)

Honeywell CPU Costing Backed

ANDOVER, Mass. — Installations with large-scale Honeywell, Inc. equipment can use the Data Processing and Price Analysis Control (Dapac) software to implement costing and charging policies and to identify and monitor various costs within the center, according to the Dapac vendor, SMC, Inc.

Operating on Honeywell 600, 6000, 60/66 and DPS systems under most releases of Gcos, Dapac records a variety of DP services performed and computer resources consumed. It works with user-established costs and billing (or charging) systems to provide a full range of control and financial management reports. Within Dapac, all input data is reduced to elements, the smallest usefully identifiable entities which have meaningful volume figures and can be costed. Each element is coded with a reference to the Standard Cost File, a user-established compilation of cost codes and costs per unit volume, an SMC spokesman explained.

On a monthly basis, the volumes and actual costs of all elements being tracked are recorded on the Cost Master File; each element is costed (charged) out; and appropriate charges to various users are recorded on the Charges Master File.

An edit run screens out errors and produces a report supporting the invoices to be generated. This report summarizes volumes and costs by cost code as well as showing actual charges billed to each user by charge number. Once this report has been reviewed, the actual billing routines can be run, producing user invoices for distribution, the spokesman continued.

Dapac provides a set of more than 40 control and management reports. It also supports a combined cost/charges file for use with Honeywell's Management Data Query Systems.

Two days of on-site support and the first year of maintenance are included in the $11,500 license fee. Maintenance after the first year costs 10% of the then-current license fee, the SMC noted from 90 Sutton St., North Andover, Mass. 01845.

SRI Updates Burroughs Editor

OKEMOS, Mich. — Systems Research, Inc. (SRI) has updated its on-line editor for programmers working on Burroughs Corp. medium-scale systems. SRI/Edit 5.0 adds to the editor's basic capabilities a time/event scheduler, user security and the ability to view and modify data files.

The original program allowed a programmer to create or modify a source program in an on-line environment. SRI/Edit automatically numbers all text lines, then allows the user to list, print, save, run, delete, find, replace and renumber the program on which he is working.

The editor can manage source programs up to 21,000 lines long. A special function has been included which allows MCP control records to be inserted in the text files, a spokesman noted.

SRI/Edit runs in approximately 35K bytes. The work file structure allows any record to be located in two disk scans and records to be effectively scanned at a rate of 1,500 line/min, he claimed.

Four levels of security control system access, full system audit reporting and a directory file on system utilization adds to system control, the spokesman said.

Supporting as many as 16 programmers working at any Burroughs-compatible terminals, the software can be used with Burroughs' data communications handler called Network Design Language (NDL) or with its own teleprocessing support.

One of the advantages of SRI/-Edit compared with Burroughs' Cande, according to SRI, is that the independent's software does not require a partition.

SRI/Edit costs $5,975 if used with NDL or $6,450 if used by itself. SRI is at 2400 Science Parkway, P.O. Box 328, Okemos, Mich. 48864.

Sanders Terminal Tied to VAX

NASHUA, N.H. — A package just introduced by the Information Products Division of Sanders Associates, Inc. enables users of Sanders' Graphic 7 display terminal to achieve interactive stroke/refresh graphics with the Digital Equipment Corp. VAX-11/780 CPU by programming in Fortran subroutine calls.

The compatibility is provided by the Model 5714 high-speed parallel direct memory access (DMA) interface and the Model 7771 VAX I/O Driver software, according to a Sanders spokesman. The 7771 package is written in VAX assembly language and runs with VMS.

Both the Graphic 7 software and the hardware are compatible with the DR11-B interface option in the VAX-11/780, the spokesman added.

The Graphic 7 is an intelligent, interactive display terminal with two programmable microcomputers and a directed beam refreshed graphic display with high-resolution images. The Fortran Support Program (FSP) — also from Sanders — permits the user to work in his own coordinate system utilizing Fortran subroutine calls.

With the multiple paging feature of FSP, highly interactive tasks can be performed with dynamic image movement and modification, Sanders claimed.

FSP costs $1,500 while the VAX I/O Driver and DMA interface packages cost $3,000 each.

Sanders is at Daniel Webster Highway, Nashua, N.H. 03061.

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'Csar' Rules DOS/VS Sites

ATLANTA — The Computer Scheduling and Reporting System from Software Concepts, Inc. supports IBM DOS/VS installations and is packaged as a batch system (Csar II) with an on-line option (OCSS) available separately.

The batch system maintains the Csar data base, produces hard-copy schedules and other reports and interfaces to the user's job accounting file. The on-line system consists of a real-time monitor that performs automatic job submission and provides the scheduler or console operator with access to the on-line data base.

The system schedules as many as 26 CPUs and workstations, working within one or more work calendars that are created in response to user-defined holidays. There is no frequency of job execution that cannot be defined, a Software Concepts spokesman said.

Csar schedules jobs as a function of job class, priority, early start, later finish, average job duration and successful completion of all predecessors, he said. Events can be scheduled as predecessors to jobs and vice versa. One or more jobs can be held until a specified event is posted as complete.

Under the on-line option, the operator never handles JCL. Jobs are submitted automatically without operator intervention.

Although the spokesman said Csar is a DOS/VS support system, product literature indicates it will run under any IBM or equivalent operating system and/or any other system that supports ANS Cobol. The on-line job submission appears to require Power/VS.

Csar II costs $9,500. The optional OCSS costs another $5,500 bringing the total cost to $15,000, Software Concepts reported from 1450 Atlanta Center, 250 Piedmont Ave. N.E., Atlanta, Ga. 30308.

Boole & Babbage Offers Software Monitor for VS1

SUNNYVALE, Calif. — Said to require less system overhead than most software monitors, the Comprehensive Management Facility for VS1 (CMF/-VS1) can be used for performance evaluation, system tuning and capacity planning, according to its vendor, Boole & Babbage, Inc.

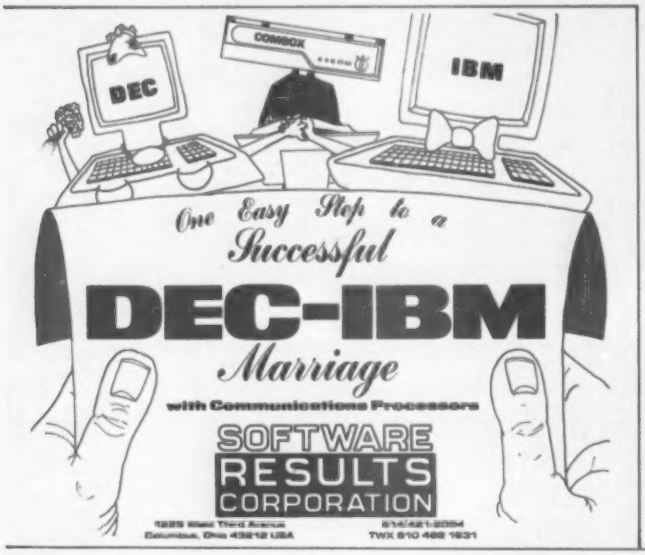
Many monitors are monolithic in structure, invoking all components even if it means carrying logic that is not pertinent to the installation using the monitor. CMF/VS1 features a single master monitor that provides an umbrella of common services, such as data collection, timing and data output, to a variety of submonitors.

These submonitors capture information on system behavior including CPU utilization; channel utilization; control unit activity; device activity; read/write head movements; paging; and real and virtual storage utilization. The Data Set Optimizer (DSO) software, a Boole & Babbage product, is a standard component of CMF/VS1, a spokesman noted.

A version of CMF — including the same umbrella plus a specialized submonitor structure — was introduced by Boole & Babbage for IBM MVS sites at least a year ago, so the concept has been exercised and it works, the spokesman said.

CMF/VS1 displays information in a variety of columnar reports, but a "complete range of graphics" including Kiviat graphs and exception reports is provided to help management evaluate overall system performance.

CMF/VS1 operates on IBM 370, 30 series and compatible CPUs under OS/VS1 Release 6.0 or above. The monitor currently costs $8,500 from Boole & Babbage at 510 Oakmead Parkway, Sunnyvale, Calif. 94086.



Article Details 300 Packages

PHOENIX — More than 300 software products from 105 vendors are listed in the "Seventh Annual Survey of Performance-Related Software," featured in the December issue of *EDP Performance Review*.

Published by Applied Computer Research, the survey has two purposes, according to Editor and Publisher Phillip C. Howard. It is a reference guide to specific products or capabilities, but it can serve as a stimulus to thinking about new ways to improve a data center's performance.

The packages provide either performance measurement capabilities or direct performance improvements. Grouped under 13 general categories — including data management, job accounting, simulation, software monitors and communications — the write-ups show each package's purpose and features, hardware and software prerequisites, vendor name and price.

EDP Performance Review is a monthly publication that provides case studies, "how to" articles on management and technical issues, conference coverage, product and service reports, literature abstracts and special events in the field of DP performance improvement.

The software survey issue is available to nonsubscribers for $10. The annual subscription fee is $60. Requests for the special issue, for subscriptions or for more information should be addressed to Applied Computer Research, P.O. 9280, Phoenix, Ariz. 85068.

Products Run In DOS/VS, VSE

(Continued from Page 31)

ally not presented to the user, according to the independent software firm.

The system accounting package also replaces those routines in DOS/VS and Power/VS that gather potentially good data but do it inaccurately, the spokesman asserted. This package costs $125/mo.

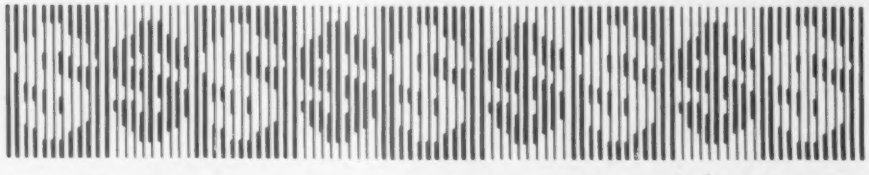
Dumpmaster, the company's third offering, replaces a standard Abend dump with a formatted printout — in abbreviated "mini" form or with full information. The minidump provides only the areas of memory that are immediately involved in the Abend, usually enough to solve the problem.

The full dump can be written to disk for possible later use, saving considerable paper in the meantime, Macro 4 said.

Unlike the standard DOS/VS dump routines, Dumpmaster does not execute in the Logical Transient Area (LTA). Therefore, full multiprogramming can continue while the dump is in progress, the spokesman noted.

Dumpmaster costs $75/mo. A "screen-sized format" option — which displays all the dump information in an 80-char. by 20-line format suitable for display and browsing on a CRT screen — adds another $25/mo. Macro 4 is at Gothic Plaza, 376 Hollywood Ave., Fairfield, N.J. 07006.

Eliminate the Hidden Costs of Systems Development



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Central Software, a systems development tool for IBM 370 users, puts a handle on the obvious and not-so-obvious costs of developing on-line and batch applications software.

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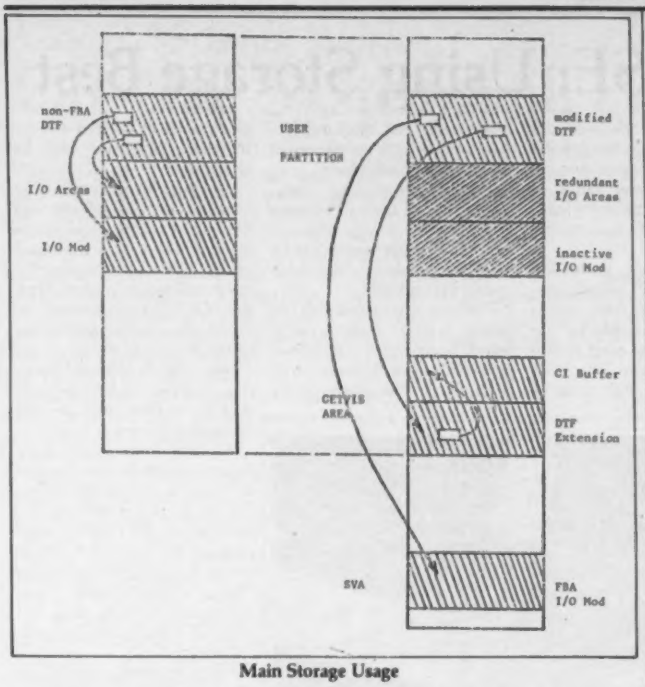


Main Storage Usage

FBA Disks and DOS/VSE: How to Use Storage Best

By Robin Shaylor
Special to CW

Using the IBM 3310/3370 Fixed Block Architecture (FBA) disks in a DOS/VSE environment presents a new set of considerations for making the best use of both real storage and disk space. Most significant among these are the resources used in running non-FBA programs in a device-independent mode.

When a disk file is OPENed that is assigned to an FBA device, any I/O module is "disconnected" from the program and becomes inactive storage. If I/O areas are defined, they serve only as intermediate buffers. All I/O is performed by an SVA-resident I/O module using its own buffer for data transfer.

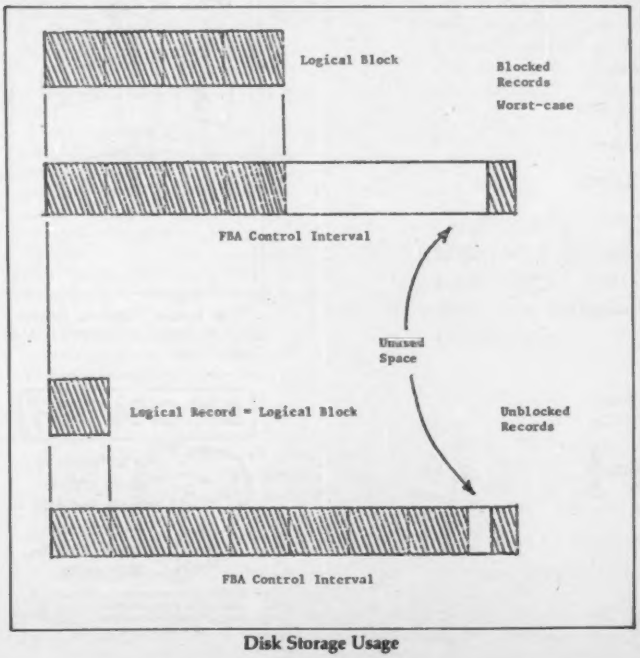
IOCS preserves the integrity of blocked files by treating blocks of data as if they were logical records. These "logical blocks" are in turn blocked and deblocked along with control information and transferred as an integral number of 512-byte FBA sectors in the form of "control intervals."

On average, the larger the logical block, the more unused space in the control interval. The accompanying figures illustrate these ideas.

Significant savings are possible by recompiling these programs with the following changes:

- Specify the device type as FBA.
- For BAL programs, ensure MOD-

(Continued on Page 34)



Disk Storage Usage

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If you're looking for blue sky promises, glossy marketing techniques or unwarranted "versions", then PDS and PASS/ACCU-PAY may not be for you. However, if you and your company are looking for a fully warranted, immediately installable, operational Payroll/Personnel System, then perhaps we should meet.

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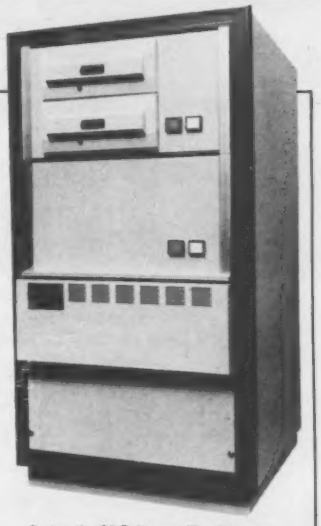

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The C3-C.
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The C3-C computer has been designed and engineered to fill the void that existed between floppy disk systems and larger hard disk systems.

In its normal configuration, the C3-C includes the Challenger III processors, 52K RAM, the 23 Megabyte Winchester drive and dual floppy drives for file system back up. And the cost is less than $10,000.

The CPU employs three microprocessors, the 6502, the Z-80 and the 6800. And the processor bus has been designed so new, more powerful micros (like 16 bit CPU's) can be added to the system later on.

There are also 10 open slots in the basic C3-C. The system supports up to 768K bytes of memory, in a multi user configuration.

The C3-B.
74 Megabytes. Under $13,000.
For those who require even more hard disk storage, Ohio Scientific offers another microcomputer in the C3 Series, the C3-B. Its specifications are the same as those of the C3-C. However, the C3-B offers a 74 Megabyte Winchester drive.

For those who do not need hard disk capacity now, but in all probability will need it in the future, Ohio Scientific offers the C3-A. It is like the C3-B and the C3-C in all respects but two. 48K RAM is standard in the C3-A, and it offers 12 open slots. When more storage is needed, the C3-A is easily expandable to either a 23 Megabyte or 74 Megabyte hard disk system. The C3-A is priced at less than $6,000.

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FBA Disks and DOS/VSE: Using Storage Best

(Continued from Page 33)

NAME is not specified in the DTF. Otherwise, the unnecessary I/O module will be autolinked with the program. Check link decks for explicitly included modules.

• Define the record form as unblocked. This ensures that the largest number of logical records are carried in the file control interval by IOCS.

• For BAL programs, omit specifications for both IOAREA1 and IOAREA2. These are not required for FBA devices and result in unnecessary data movement and wasted real storage.

Control Interval Size

Selecting a control interval size has the same importance as choosing a blocking factor for non-FBA devices. If a value is not specified in either the file definition or through the new DLBL 'CISIZE' parameter, IOCS chooses one based on a calculation involving logical block size, number of I/O areas and range of block size. No attempt is made to minimize unused control interval space.

Our computer evaluation comparing IOCS default control intervals vs. ones chosen for best fit for unblocked records shows an average 17% to 20% improvement in space utilization for a wide range of block sizes and blocking factors and a 49% improvement in worst-case situations.

Various monitoring, measurement and analysis systems including the dossier program and file analysis reports can be used in implementing these conservation ideas.

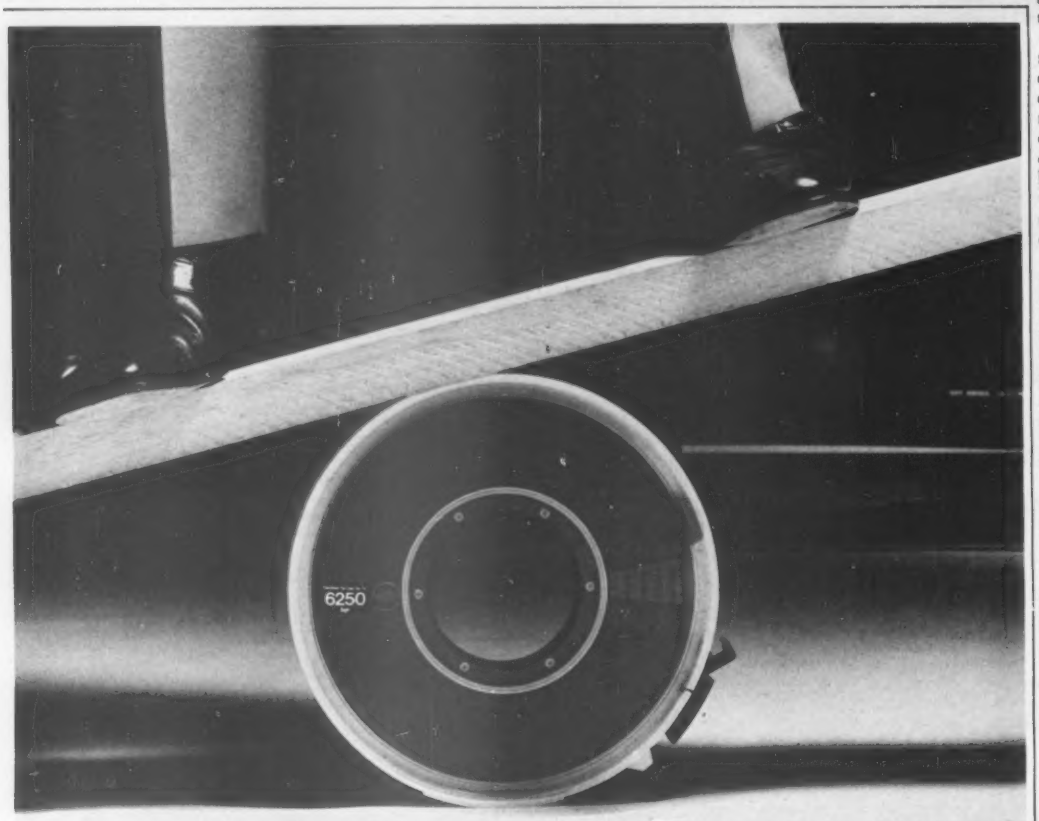
The basic report and disk file usage report show exactly which programs reference non-FBA disks. This can serve as a list of programs to be changed or a check of any remaining programs to be changed.

Information for choosing the best control interval size and the number of physical blocks in the file extent are presented in the Dossier Version 7.0 track utilization report. First, the IOCS default control interval size and the percentage of the space actually in use are shown. This is followed by alternative control interval sizes and their associated percent utilization figures.

Adjacent to these figures are ratios for converting number of tracks to number of physical blocks when making the necessary EXTENT card changes for each FBA file. A conversion ratio for records to blocks is also shown. These two figures take the place of a series of complex manual calculations.

Once the control interval size which provides the best balance between disk space utilizations and other factors is selected, specify it either in the file definition along with other changes or in the DLBL card along with the EXTENT changes. This report provides an on going basis for optimizing all future FBA files.

Shaylor, the original developer of Dossier, is an independent DP consultant. Dossier is offered by Computer Concepts, Inc. of Portland, Ore.



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'Carma' Speeds Work

On-Line System Still Helps 'Frederic' Victims

Special to CW

MOBILE, Ala. — The wind and the rain ended months ago, but an estimated 15,000 displaced families in the Mobile area will continue to cope with Hurricane Frederic's aftermath for as long as another year and a half.

The Federal Emergency Management Agency (Fema) and the State of Alabama, responding to Mobile's plight, are using a computerized disaster information system supplied by Culpepper Associates and Planning Research Corp. over the GTE Telenet Communications Corp. packet-switched network.

Many of the families displaced by Hurricane Frederic had just finished paying back government loans taken out 10 years ago when Hurricane Camille devastated the Gulf Coast in 1969. Although improved early warning and evacuation procedures prevented Frederic from claiming as many lives as Camille did, Mobile area citizens are digging out their battered, flooded homes once again.

The new management information system (MIS) package will help federal and state workers respond more quickly both to human needs and to financial assistance applications following this disaster. Called Carma, the system was developed jointly by Planning Research Corp. and Culpepper Associates last May. It includes responses to the Wichita Falls, Texas, tornado; the Houston, Texas, flood; Iowa tornadoes; an Indiana flood; and now Hurricane Frederic in Alabama.

Carma is a specialized computer-based MIS designed to help both field workers and headquarters managers in agencies active in disasters and related emergency programs. According to co-developer Charles Culpepper, the system is especially helpful in large-scale programs like the situation in Alabama.

Relief Phases

Disaster relief efforts go through several phases. During and immediately following a calamity, lifesaving and emergency medical treatment are the first priorities. But within a few days, Fema, state and local workers start to untangle the mass of more long-term chaos.

These workers must identify displaced families and satisfy their immediate needs for food, shelter and transportation. At the same time, they must process thousands of applications for financial assistance, home repairs and "temporary" housing for families whose homes will be uninhabitable for months while structural repairs are made.

Concurrently, Fema and state workers must account for government resources used in meeting this crushing demand load.

Tracking and reporting used to be done manually. Dozens of disaster workers equipped with index cards, complicated registers, and pencils would work day and night just to keep up with daily case loads. Real-time status reporting and cost accounting were impossible.

Today, field workers who staff assistance offices in the Mobile area are equipped with remote terminals to access Carma interactively. They simply call a nearby Telenet public dial-in facility (which GTE/Telenet has expanded especially to handle disaster traffic) and connect to the Planning Research Corp. Computer center in McLean, Va.

Carma captures essential information to identify the applicant, facilitate processing and track the progress of each case. Data regarding each applicant's file is stored on-line, so caseworkers can quickly check on the status of any application and expedite the processing of requests for assistance.

Fema and state managers also use Carma to help administer the overall operation. The system provides up to five major data files and 12 separate program options that can be called up as needed.

Carma's on-line capabilities include:

- Input of basic applicant-identification data.
- Recording each family's special needs in emergency housing, such as ground-level apartments for families with elderly or handicapped members.
- Verification of identification and eligibility data from independent sources.
- Verification of applicant requirements through in-depth interviews.
- Case assignment to appropriate resource agency.
- Progress tracking.
- Daily, on-line progress reporting.

The emergency phase of the housing program ends officially when all displaced families have been provided with temporary housing assistance.

However, files can be kept on-line for an additional year or more to assist managers in administering the program until the last family has returned to permanent housing and the case is closed.

Eventually, Culpepper and Planning Research Corp. expect that data gathered from Carma applications will be useful in "disaster modeling" to help insurance companies and government agencies know more fully what to expect in future situations.

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Payroll Package Based on CP/M

CAMPBELL, Calif. — Complete handling of payroll activities for firms with as many as 80 employees is possible with a package based on the CP/M microcomputer operating system, its vendor, California Business Computers Corp., said.

The package manages all the conventional functions — calculation of pay and deductions, including federal and state taxes — and has the Earned Income Credit provisions built in, a spokesman noted.

While federal and state tax routines are part of the standard package, special city, county or district tax deductions will be programmed by the vendor without cost.

The program requires CP/M, originated by Digital Research, the C-Basic or C-Basic2 language and diskette support. The software is distributed on 8-in. single- or double-density floppy disks or Micropolis, Inc. 5.25-in. disks.

The package costs $595 and is available from 825 W. Hamilton Ave., Campbell, Calif. 95008.

'Promt' Offers Support For Program Development

COLUMBUS, Ohio — Goal Systems Corp. has announced the release of Promt, an interactive terminal-oriented product designed to simplify program development, library maintenance, data entry and job submission.

Promt does not require a dedicated partition, dedicated terminals or dedicated libraries. Currently, it runs as an application under the Westinghouse Electric Corp. Westi teleprocessing system. A CICS version of Promt for IBM users is in development, according to a spokesman.

Full scan capabilities are supported, which allows complete data manipulation capabilities, he said, as are full screen edit and variable split-screen formats. Commands may be concatenated and a Promt procedure facility is available.

The usual complement of features are also supported, including bookmarks; tabs; page forward or backward; scroll forward or backward; add, replace and delete; copy whole or parts of work files into other work files; and group alter and scan.

Additionally, Promt has a complete Power/VS interface which includes submitting jobs, examining output and altering or deleting jobs. Any source, relocatable, procedure or core-image library can be maintained via Promt, Goal said.

Promt will directly allow reading from and writing to any number of source statement libraries and will allow rename and delete functions on all library types. A storage and core-image library display and zap feature is included.

Functions can be password-protected to keep access from unauthorized persons. Promt supports any IBM 3270 screen size from 960 to 3,440 characters.

Promt for DOS/VS Westi users can be leased for $60/mo; a permanent license can be acquired for $1,944. Goal can be reached at P.O. Box 29481, Columbus, Ohio 43229.

Data Base System Ready for Users Of Wang VS

LOWELL, Mass. — Wang Laboratories, Inc. has announced data management software for use with its VS series processors. The Advanced Data Management System (VS-ADMS) is said to centralize control of data descriptions and files.

That control derives primarily from a menu-driven interactive utility called a Data Definition Processor. It permits selective exclusion of records and data items from a user's view of the data files and reduces the number of programs to be recompiled when a record description is modified, a spokesman explained.

VS-ADMS also provides the facility for shared use of files and the ability to lock an entire file, range of records within a file or individual records to prevent concurrent — and therefore erroneous or inconsistent — data entry.

VS-ADMS is provided free as part of the Wang VS operating system.

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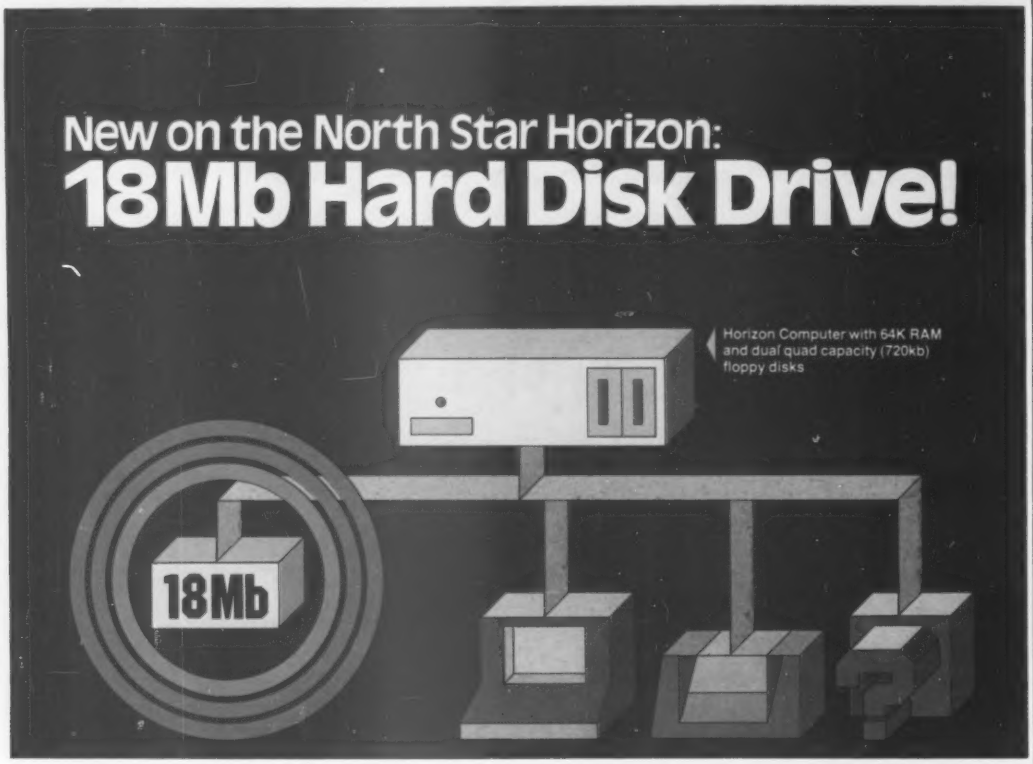

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Costs Less Than $5,000

Serial Matrix Printer Gives 900 Char./Sec

By Brad Schultz
CW Staff

MELBOURNE, Fla. — A serial matrix printer capable of 900 char./sec performance — a rate several times faster than what most leading serial printers offer — is available to data communications users for less than $5,000.

Florida Data Corp., which has about a year's experience in the printer game, bills its Model 600C as the industry's fastest serial impact device. The matrix printer's speed is determined by the number of characters printed on a horizontal inch, a spokesman noted.

The user can specify 15 char./in., a compressed font, to get 900 char./sec performance or 10 char./in., a wider spaced font, to get 600 char./sec throughput (see figure on Page 41).

The 600C comes standard with either Centronics Data Computer Corp.'s or Dataproducts Corp.'s 8-bit parallel communications interface. Options include a choice of serial interfaces; interfaces for IBM's 2780, 3780, 2770 and 3270 communications protocols; and a means of running with Honeywell, Inc.'s VIP 7700 and RLP 300 protocols.

Other options include compatibility with Univac's BCT 1000 protocol and Burroughs Corp.'s and NCR Corp.'s poll and select structure.

Through software or panel switches, the operator can change fonts or vary the size of characters. Vertically, a 6- or 8 line/in. format is offered; the latter format entails less paper consumption for a given amount of text (as would a compressed font).

With 14-7/8-in. paper, line length can be 198 char., the vendor said.

Florida Data already markets a 600 char./sec model known as the 600A. Aside from the 600 impact printer series, the fastest serial matrix devices run in the 300 char./sec range, the spokesman maintained.

Similar to typewriters, serial printers generate one character at a time and then space to the next

(Continued on Page 40)

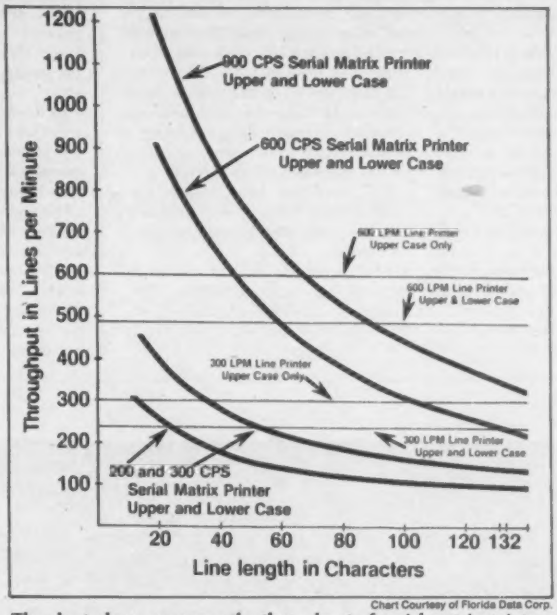

Chart Courtesy of Florida Data Corp.

The chart above compares the throughput of serial matrix printers with the throughput of 300- and 600 line/min line printers.

Aussies Offer Multiprotocol Terminal

By Tim Scannell
CW Staff

NEW YORK — ECS Microsystems Inc. kicked off its expansion into the U.S. from Australia last week by introducing the first in a series of multiprotocol, multifunction, microprocessor-based terminals geared for decentralized and stand-alone computer processing.

Presently headquartered in San Jose, Calif., close to parts suppliers and a number of potential customers, the firm drew upon its roots for the product debut, choosing the Australian Consulate here as a stage for the ECS 4500 terminal. Described by the firm's spokesmen as "not just another pretty face," the device was designed to interface with all major mainframes and, with up to 256K bytes of memory, can function as a stand-alone information processing system.

Aimed at the "user-programmable market," the terminal features a Z80 microprocessor and communicates with mainframes at rates of 75- to 19.2K bit/sec.

(Continued on Page 40)

Play It Smart or Dumb?

You sure can get a lot with terminals these days. So-called intelligent units extend operator flexibility and lighten the loads of host CPUs.

But isn't it sometimes smart to play it dumb? After all, intelligence costs more, and it may require additional operator training, which consumes both time and money.

What's the trade-off between smartness and dumbness in terminals? What DP environments are best suited to the fancier gear? What should buyers look for in terminals? How are they best implemented?

A March 31 *Computerworld* Special Report on data communications terminals will answer those questions. If you can help, send tutorial essays, accounts of user experiences, reviews of current products and speculations about the future to the report's editor, Brad Schultz, at CW, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701 no later than Feb. 10. Texts should be no longer than six typed double-spaced pages.

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Message Switch Unveiled

EL SEGUNDO, Calif. — A multiprocessor message switch for both message and transaction processing is available from Computer Sciences Corp. (CSC).

The MS400 was designed for such applications as electronic funds transfer; police and fire department communications; transaction processing operations where large clusters of terminals access different CPUs; and heavy commercial traffic volumes in domestic and international telecommunications.

Featuring CSC software and minicomputer hardware from Tandem Computers, Inc., the switch can support "a variety of line protocols and terminals," a spokesman claimed. Configurations for a single switch are said to range from two to 16 processors.

Each pair of processors in the MS400 provides up to 4.8G bytes of mass storage and 2M bytes of main memory, the spokesman continued. A processor duo delivers up to 116 lines for synchronous channels or 224 lines for asynchronous channels, reportedly permitting a single switch to support more than 1,500 communications circuits.

CSC said the MS400 interfaces with TWX, Telex, Direct Distance Dialing and international switched networks.

The price of a two-processor MS400 begins at $350,000, CSC said from 650 N. Sepulveda Blvd., El Segundo, Calif. 90245.

Serial Matrix Printer

(Continued from Page 39)

horizontal position. Line printers which generate one line at a time in a parallel arrangement, can be much faster than serial printers (in terms of line/min), but 50 times more expensive.

As the figure on Page 39 shows, serial print speeds can be reckoned in char./sec instead of line/min, but line/min serves as almost the only meaningful way to judge line printer speeds.

The figure contrasts the performance claimed by Florida Data for its 600C device with the performance ascribed to two levels of line printer and two levels of serial printer. The curves represent serial printer throughputs and the horizontal lines represent line printer throughputs.

In terms of line/min, throughputs are plotted against each printer's line length (at different settings) in characters.

The figure shows that serial printer throughput declines significantly as longer print lines are specified. Conversely, the shortest line possible with the 600C — 20 char. — is said to allow unprecedented serial printer throughput: 1,250 line/min in the compressed 15 char./in. font and 1,000 line/min in the 10 char./in. font.

The curves that respectively represent 200- and 300 char./sec serial matrix printers are well below the curves associated with the two font versions of the 600C.

Turning to the line printers, the figure shows that users can achieve higher throughput if they limit themselves to upper case printing. The output process slows down when line printer users insist on lower case printing as well. (Usually, 96 char. comprise the upper/lower set; 48 char. are in the upper case set.)

Hence, Florida Data noted that a line

The only difference between IBM's 4341 and ours is about $1,700. a month.

If you expect delivery on an IBM 4341 system costing at least $400,000 and you expect installation before June 30, 1980, you're in luck.

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COMPUTER INVESTORS GROUP
488 Madison Avenue, New York, N.Y. 10022

Aussies Bring Terminal to U.S.

(Continued from Page 39)

The unit generates separate RS-232C synchronous or asynchronous receive and send signals.

A number of optional communications protocols include IBM 3271 and 3275, Digital Equipment Corp. VT52 and VT100 and Burroughs Corp. TD700, 800, 820 and 830, a spokesman explained.

The terminal has two minifloppy disk drives with a total of 983K bytes of storage and an 80-column green-phosphor CRT display that has a 256-char. programmable set and a memory-mapped video feature to aid horizontal and vertical scrolling. The unit's MPU has a 16K buffer for display and I/O functions and a clock frequency of up to 4 mHz.

Software Options

The ECS 4500 is supported by a variety of both development and applications software and can be outfitted with a number of "ready-to-use" business and word processing packages, the spokesman continued. The system can handle Basic, Cobol and assembler languages and can be down-loaded with programming code from the host CPU. Printer drivers, text preparation, macro assembler, editor and debugger software is also available.

To facilitate getting information out of the 4500, the terminal features several printer interfaces that accommodate a number of printer models, including the Centronics Data Computer Corp. 700 series, DEC's LA series and Diablo Systems, Inc.'s Hytype.

Targeted for dispersed and multiprocessor computer systems rather than the single small business computer environment, the 4500 costs about $6,100 in quantities of 20. The typical system configuration includes 64K bytes of random-access memory; the two disk drives; the CRT; keyboard; operating system, utilities, diagnostic and Basic language software; and on-site setup and training.

ECS is located at 215 Devcon Drive, San Jose, Calif. 95112.

From Florida Data Corp. Outputs 900 Char./Sec

printer rated at 600 line/min for upper case-only printing might deliver a throughput less than 500 line/min when both cases are engaged. A line printer rated at 300 line/min for upper case work might turn in a sub-250 line/min performance should both cases be applied.

Fastest Printers

However, the world's fastest impact matrix printers run in a different league altogether. They come from a neighbor of Florida Data's — Melbourne, Fla.-based Documation, Inc. — if a recent Datapro Research Corp. study is correct.

Last month, Datapro published a revision of "All About Plug-Compatible and Off-Line Printers," a survey of user experiences with the most expensive class of printers — line-at-a-time devices that may cost far more than their host CPUs. The study also includes charts that contrast the performance and features of 58 line printers from 21 suppliers.

According to Datapro, Documation's Impact line printer series currently consists of 11 models that deliver top speeds of 1,000-, 1,200-, 1,250-, 1,550-, 1,600-, 1,800-, 2,000-, 2,250-, 2,600, 3,000 and 3,800 line/min.

World champ is reportedly that vendor's Impact 3800 printer/controller, which attains the 3,800 line/min pinnacle with a lower case 48-char. set. A throughput of 3,125 line/min is offered with a 64-char. set, Datapro stated.

The Impact 3800 is said to run at 2,300 line/min — almost twice the Florida Data 600C's top pace — with a 96-char. set.

The Documation Impact 3800 features changeable fonts, a maximum standard line length of 132 char., an optional line length of 150 char. and maximum horizontal spacing of 10 char./in., Datapro said.

With its 600 family of serial printers, Florida Data does not aim to lock horns with the top line printer makers, however. The 600C is targeted for small to medium-size businesses, according to the spokesman. In that arena, the product would serve such applications as general ledger and inventory control — tasks known to swamp conventional serial printers and a humbler category of line printers.

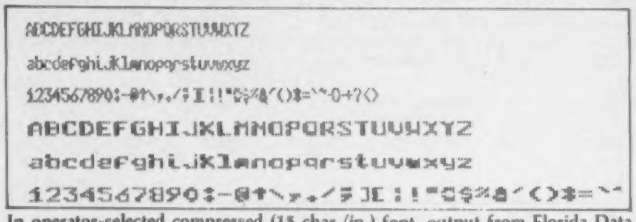
Cost is a point of distinction between the line printer elite and serial devices like the 600C. For example, Datapro put the monthly tab for leasing Documation's Impact 3800 on a two-year plan at $4,604 — more than the 600C's purchase price of $4,550. The Impact 3800 costs $120,000.

In fact, the most sophisticated line-printing systems sell for more money than some university computer science departments have for annual budgets. They vary in methods of producing hard copy and in some cases are not suitable for data communications.

The most expensive printer in the Datapro report is Univac's Model 0777. Costing $364,000, the electrophotographic 0777 has a print speed of 159 page/min, Datapro found. That speed is reportedly achieved regardless of character set size or density of font.

The 600C's serial interface options cost between $200 and $300, the Florida Data spokesman said. The protocol interfaces go for about $1,000 each.

Florida Data is located at 3308 New Haven Ave., Melbourne, Fla. 32901.



In operator-selected compressed (15 char./in.) font, output from Florida Data Corp.'s 600C serial printer looks like this. Characters come in two sizes.

Corrections

A.S. Hansen, Inc. surveyed users in 84 metropolitan areas to compile the 1979 Weber Salary Survey discussed recently from the telecommunications standpoint [CW, Jan. 14]. The city names associated with each "City Level" in that converage represented metropolitan areas that include many suburban towns and communities and were cited as examples of the numerous areas Hansen studied at each level.

In that same issue, the maker of the Comm-Stor II communications storage unit was not fully identified. It is Sykes Datatronics, Inc. of 375 Orchard St., Rochester, N.Y. 14606.

Finally, Microdata Corp.'s Reality C6557 is marketed as a communications system in its own right. An article [CW, Nov. 5] indicated that a C6557 can be formed by adding the vendor's 5750 terminal to its Reality system. The 5750 is part of the C6557 package but is not sold as a Reality add-on, according to Microdata.

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Data Analyzer Boasts Easy Training Capability

ALEXANDRIA, Va. — Rapid training capability is a "very important part" of Atlantic Research Corp.'s (ARC) Interview 3500 programmable data analyzer, according to an ARC spokesman.

The portable (31-lb) 3500 can be connected anywhere between a CPU and modem, modem and modem or modem and terminal. "Anyone with the slightest familiarity with data communications can operate the unit," the firm declared.

The analyzer includes three training tapes designed to "walk" the user through a three-hour teaching program. A menu format and other prompting features were designed to guide the operator.

The 3500 has a 7-in., 640-in., 640-char. CRT and an integral cassette tape drive that uses preprogrammed tapes to set up and monitor the network. The program can be saved on tape along with the recorded data for future analysis and the unit can duplicate tapes for distribution to field service personnel, ARC said.

As a monitor, the 3500 reportedly allows the user real-time access to view data, provides a summary of program characteristics and results of counters (there are four) and two timers.

In the program mode, the user can edit and enter the data-monitoring program. A microprocessor-prompted menu shows only necessary parameters to make it easier to select the monitoring or analyzing function on a full alphanumeric keyboard, the firm said.

The 3500 is said to eliminate the user's need to learn about jumps, subroutines, interrupts or macro instructions by allowing him to specify any one of eight "trigger" conditions that will sense any combination of characters, interface leads and internal flags (used to make one trigger dependent on another), ARC said.

The unit reportedly has the following bit-oriented protocol features: each block is indicated good or bad; strings up to eight characters permit indexing into definition bytes for Systems Network Architecture (SNA) and for packets (for X.25); character string includes a bit mask ability to select specific bits and ignore others.

In addition, counters can be assigned to record traffic of a given type or to a given address and nonreturn to zero inverted (NRZI) is standard.

The Interview 3500 costs $9,900 and the same system is available without the tape drive (as the Interview 3000) for $7,900, ARC said from 5390 Cherokee Ave., Alexandria, Va. 22314.

CRT Compatible With VT-100s

PENNSAUKEN, N.J. — A 132-column APL CRT terminal from Datamedia Corp. reportedly offers full Digital Equipment Corp. VT-100 compatibility.

Called the DT80/5, the terminal is also compatible with the firm's own Elite 1520 APL CRT terminal. It displays 24 lines of either 80 or 132 characters on a 12-in. CRT and produces the full Ascii character set, the vendor said.

In addition to the 95-char. APL set, the DT80/5 offers 69 overstrike combinations and 31 special graphics characters. The system supports an auxiliary printer and is capable of operating at communications speeds of 50 bit/sec to 9.6K bit/sec. It will be available in February for $2,295, the vendor said.

Datamedia also announced the availablity of 15-in. CRT versions of the DP80/5 and its previously introduced DT80/1 — the DT80/5L and the DT80/1L. The larger CRTs are aimed at providing greater readability. The two units cost $2,395 and $2,695, respectively.

Datamedia is headquartered at 7300 N. Crescent Blvd., Pennsauken, N.J. 08110.

Module Lets Memorex 1270 Service Remote Terminals

ESCONDIDO, Calif. — A dual-channel, programmable, limited-distance modem card from DEI Teleproducts reportedly allows the Memorex Corp. 1270 to service terminals remotely without the need for collocated data sets or special adapters.

The plug-in DCCI module replaces the 1270's standard EIA modem interface module and connects to the remote terminal sites through four-wire cable.

The DCCI operates asynchronously at 2.4K, 4.8K, and 9.6K bit/sec, or can be programmed to operate synchronously at 2,400-, 4,800-, 9,600-, or 19.2K bit/sec. Cost is $375.

More information is available from DEI at 563 N. Citracado Pkwy., Escondido, Calif. 92025.

Device Cuts Need For Two Modems

SANTA ANA, Calif. — A modem eliminator has been introduced that features full- or half-duplex asynchronous operation at up to 1,200 bit/sec on "IBM Selectric, CRT or Ascii" terminals, according to the vendor.

Western Telematic, Inc.'s E103 reportedly eliminates the need for two modems or acoustic couplers when connecting an RS-232C I/O terminal directly to a nearby computer or connecting two terminals within a distance of 1,000 feet.

Connection is accomplished by plugging the 25-pin RS-232C connector from the terminal in either E103 plug and the cable from the CPU in the other.

Cost of the E103 is $50 from Western Telematic at 2435 S. Anne St., Santa Ana, Calif. 92704.

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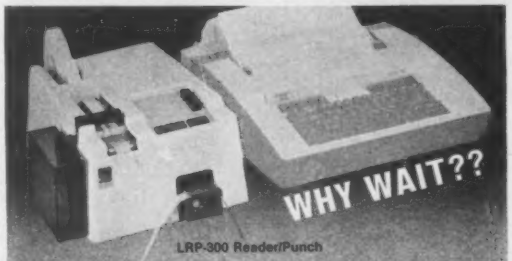

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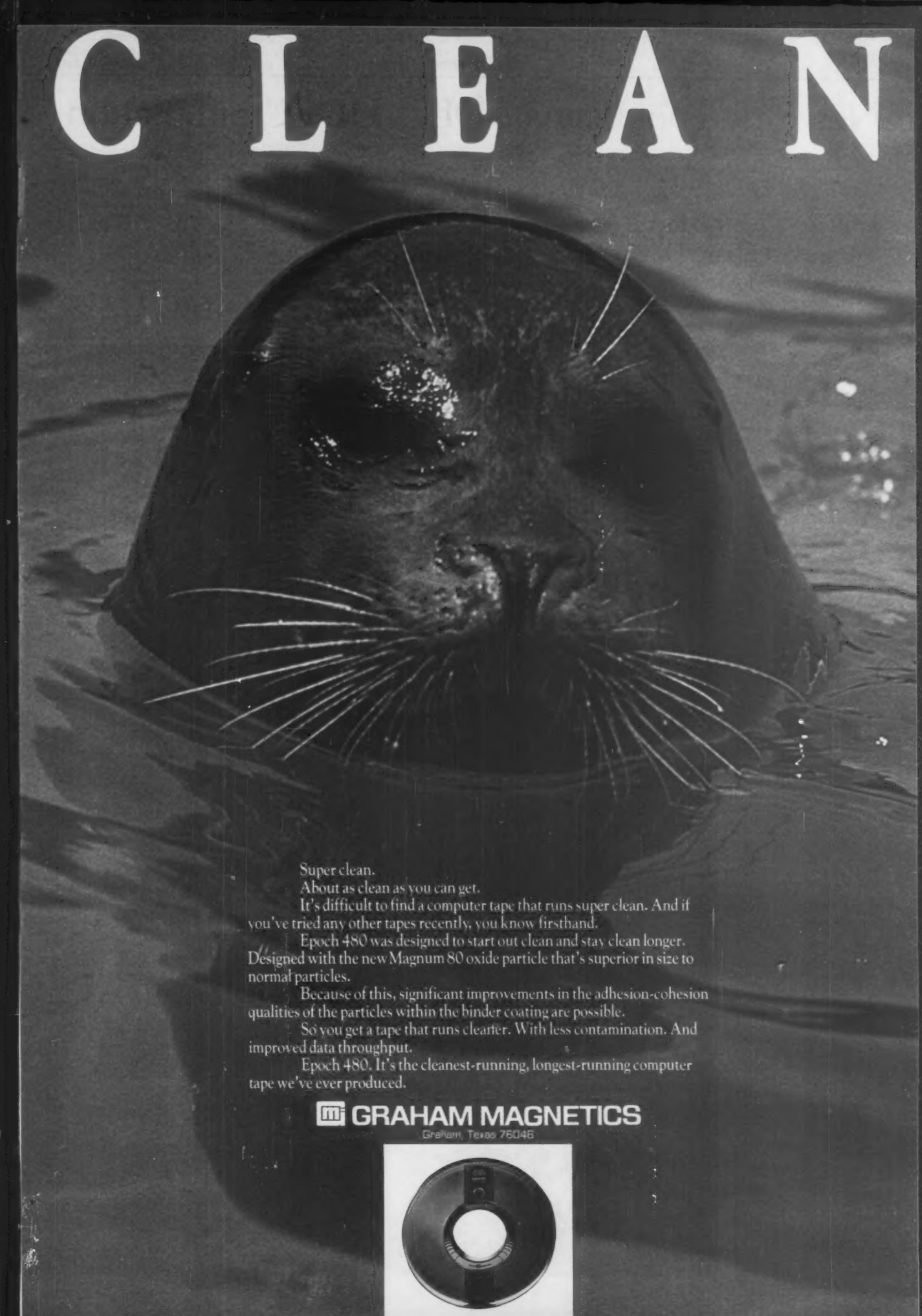

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Network Tool Gains SDLC, HDLC Simulation

GREAT NECK, N.Y. — Network Analysis Corp. (NAC) has enhanced its Modular Interactive Network Designer (Mind) by adding the ability to simulate the Synchronous Data Link Control (SDLC) and High-Level Data Link Control (HDLC) protocols.

The Mind system is used by network operators to simulate network performance under varying configurations and to create least-cost line layouts, according to NAC.

The enhanced release also makes it easier to describe the network characteristics to the simulator module. To specify network traffic, the firm explained, the user enters the following information for each type of traffic: message length; number of occurrences in the peak hour by terminal type; and host processing time. Where cluster controllers are employed, the user specifies which terminals are associated with each controller.

The user can also specify his service order table, indicating polling sequence and frequency. NAC is planning to add the Dataphone Digital Service (DDS) tariff to Mind early this year so users can compare least-cost topologies using DDS lines or multischedule private-line services, NAC said.

Mind is available through a time-sharing service for a license fee of $10,000 for the first year, which includes training, documentation and a consultation program. NAC is located at 130 Steamboat Road, Great Neck, N.Y. 11024.

Unit Lets Four Modems, Terminals Share Device

LINCOLN, R.I. — Polling network hardware costs can reportedly be reduced with International Data Sciences, Inc.'s (IDS) 6101 Sharing Unit.

The 6101 was designed to allow varied combinations of up to four modems or data terminals to share a common communications device. Its use can simplify and/or expand a data communications system by decreasing the number of computer ports, modems and transmission lines required for existing and future operations, according to IDS.

The unit operates at speeds up to 19.2K bit/sec in both synchronous and asynchronous modes. For synchronous operation, a common transmit timing signal can be derived from the common side interface, distributed channel or from an optional internal clock.

A ready-to-send/clear-to-send time delay is provided when the 6101 interconnects a common data terminal and distributed data terminal equipment, and the delay can be selected on a channel-by-channel basis for 5-, 50-, 150- or 200 msec. Each channel incorporates an anti-streaming timer to prevent a distributed device from occupying excessive channel time, according to the manufacturer.

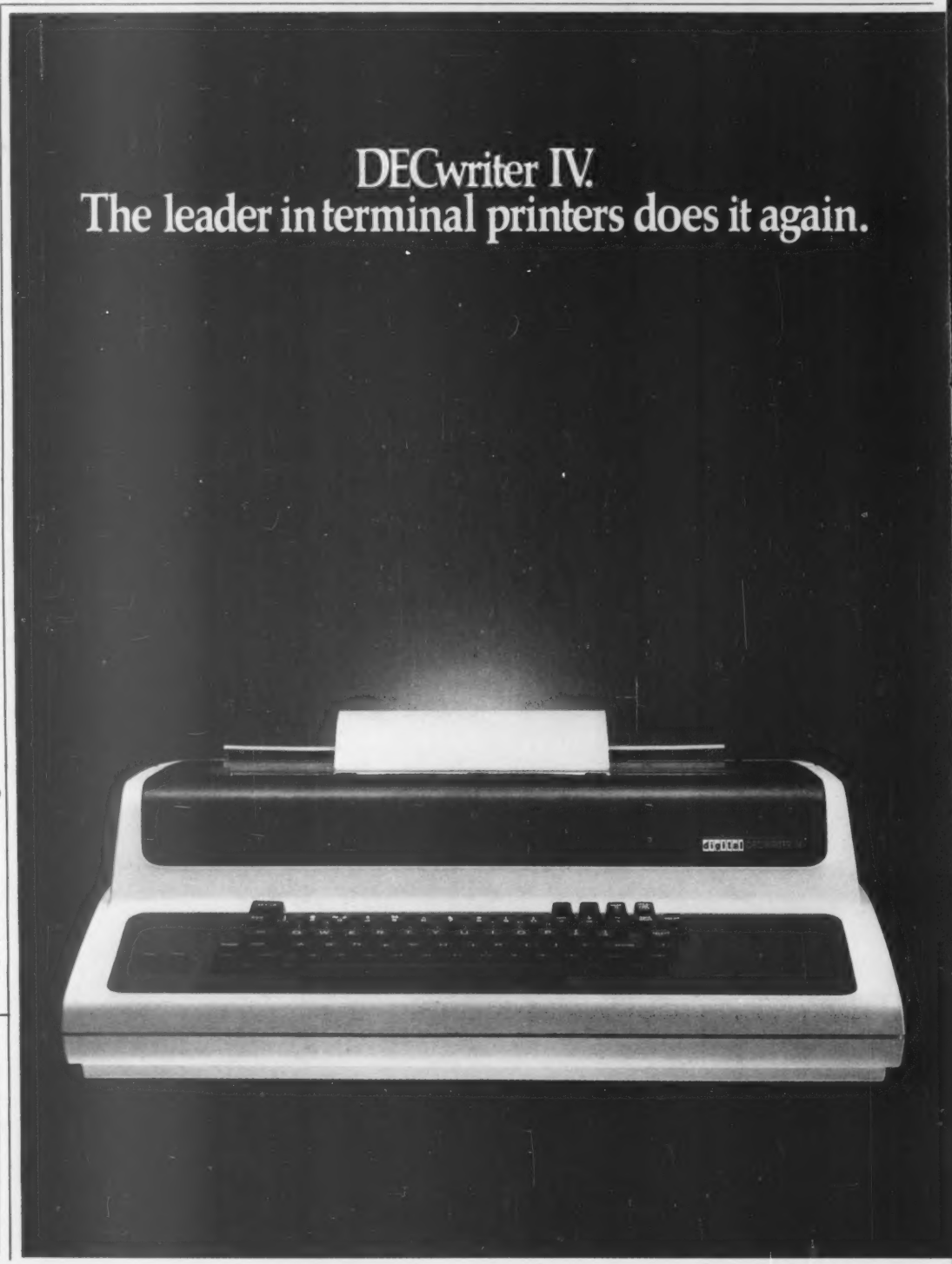
Modems and data terminals can be collocated up to 50 ft from the 6101, and devices can be separated up to 500 ft from each other with IDS low-capacitance cable.

The 6101 costs $650 from IDS at 7 Wellington Road, Lincoln, R.I. 02865.

Wall Plates Take RS-232C Hookup

RIDGEFIELD, Conn. — Wall outlet plates that accept RS-232C connectors are available from Data Set Cable Co.

The plates have the same dimensions as ordinary electrical box covers and can be ordered with one or two openings for $5 each, the firm said from 722 Danbury Road., Ridgefield, Conn. 06903.



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AJ Unit Full-Duplex

SAN JOSE, Calif. — A full-duplex, 1,200 bit/sec modem is available from Anderson Jacobson, Inc. (AJ) for interactive time-sharing operations, message network operation and distributed processing.

The AJ 1256 was designed to run as a direct-connect modem and is registered with the Federal Communications Commission to work with the RJ 11 standard phone jack as well as the RJ 41 and RJ 45 "data" jacks. It operates in originate/auto-answer modes and is compatible with itself, all Racal Vadic, Inc. VA 3400 series modems, AJ's 1255 and the AJ 1234 acoustic coupler, the vendor said.

The unit costs $845, AJ said from 512 Charcot Ave., San Jose, Calif. 95131.

Expandable Processor Debuts

BRISBANE, Calif. — An expandable communications processor that performs protocol emulation, code conversion, message switching, data concentration and device emulation via the RS-232C interface is available from Datastream Communications, Inc.

The ECP 1010 communications processor can accept any RS-232C device, translate its function to line protocol for transmission or emulate another RS-232C device for message switching, a spokesman claimed.

Based on Intel Corp.'s 8085 microprocessor, the ECP 1010 is programmed with standard line protocols and display drivers or can be programmed to fit the user's special needs, the spokesman added.

The ECP 1010 allows an operator to choose from more than one minicomputer or remote mainframe attached to the processor by means of a menu format. Workstations can choose between reliance on minis, mainframes or service bureaus at will, Datastream said.

The processor allows five types of ports. Asynchronous ports reportedly serve modems, autodialers and teletypewriter devices in the 110- to 2,400 bit/sec range. Synchronous ports allow direct distance dailing or leased- and private-line operation as fast as 9,600 bit/sec. The ECP 1010 also has printer ports, CRT station ports and ports for direct connection to the host CPU, Datastream said.

As port and CPU use and memory requirements increase, the ECP 1010 can be upgraded by plugging in independently operating CPU boards. It will run as many as eight CPUs and address up to 1M byte of memory.

To add ports, the user can acquire more of the firm's S108 plug-in boards, each containing eight universal synchronous/asynchronous receiver transmitters.

The basic ECP 1010 costs $34,000, and the price rises with the capabilities and number of ports requried, according to the vendor at 430 Valley Drive, Brisbane, Calif. 94005.

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Two Modems Sense Rate Of Traffic

ROCKVILLE, Md. — Two modems capable of sensing incoming traffic and automatically adapting the required data rate and format have been introduced by Syntech Corp.

The Syntech SDP-201 automatically accepts calls from either Bell 201A or 201C modems (2,000- or 2,400 bit/sec.) The 208+ works with the Bell 201C and 208B modems (2,400- and 4,800 bit/sec, respectively).

Traffic detection/modem control logic is contained in a separate module called the automatic data rate selector unit. It permits any Syntech 201 or 208 modem to be upgraded to provide automatic rate/format selection operation.

The SD-201 costs about $1,000, while the 208+ goes for about $3,000. Syntech is at 11810 Parklawn Drive, Rockville, Md. 20852.

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Adapter System Unveiled

ATLANTA — A polling adapter system for use with any computer that cannot economically provide a poll/select communications protocol was introduced by Modemsplus, Inc.

The vendor's Translation 200 adapter system requires each remote terminal to use a Modemsplus Gobetween Translation 102 remote polling adapter, which has a switch-selectable two-character address that responds to the polling query from the Translation 200.

The adapter system is said to allow construction of a telephone line communications link with modems at any required location. The system also allows error detection using a block check character and correction key retransmitting the erroneous data block, a spokesman added.

In quantities less than 10, Gobetween 102 and Translation 200 cost $595 each and between $1,295 and $4,295, respectively.

Modemsplus is located at Suite 260, One Perimeter Way, Atlanta, Ga. 30339.

Rixon Repackages T113C Modem

SILVER SPRING, Md. — Rixon, Inc. has repackaged its T113C modem in a compact case. For asynchronous transmissions at up to 300 bit/sec, the T113C is now available in either a stand-alone enclosure or as a card modem for rack mounting.

The new version can be used with Bell 500-type telephones and costs $415.

Rixon is at 2120 Industrial Parkway, Silver Spring, Md. 20904.

Gauges Overall Productivity

Terminal Monitors Plant Efficiency

ATLANTA — Manufacturers can gauge machine operator efficiency and overall productivity with a factory data collection terminal from Sierra Research Corp.

Offered by Sierra's Data Systems Division, the Datamonitor automatically monitors production at machine tools, assembly stations and other workstations in a shop.

The Datamonitor either monitors the machine cycle or actually counts finished pieces using sensors, according to a division spokesman.

A universal interface permits direct attachment of Datamonitors to minicomputers or most business computers. Terminals are polled periodically by the central computers to accumulate shop data.

Incentive payroll, material status, efficiency, machine utilization and other performance and management reports are generated using data collected by the Datamonitor from the shop floor, replacing reports from shop foremen.

Low-Voltage Cables

Power is distributed to the Datamonitors via low-voltage cables on the communications lines, and up to 16 terminals can be attached to a single power-communications serial-loop cable.

The Datamonitor lists for $1,900; however, typical orders are for 150 units or more, with per-unit prices from $1,500 to as low as $900, the spokesman said from 6520 Powers Ferry Road, Atlanta, Ga. 30339.

Up to 16 terminals fit Sierra's Datamonitor.

Canadians Get Datapac Access

OTTAWA — Access to Datapac, the packet-switched data network of the Transcanada Telephone System (TCTS), is now available through TCTS' Computer Communications Group here.

Called Datapac 3304, the access service is designed to support IBM-compatible host computers and remote job entry (RJE) terminals, a spokesman said.

The service reportedly supports the IBM Binary Synchronous multileaving communications protocol implemented by the Computer Communcations Group.

Targeted Users

Datapac 3304 is aimed at service bureaus, government and large business users with customers or RJE branches tied to centralized computer systems, the spokesman noted.

More specifically, "the service is designed for the remote batch and RJE users who now generate about two-thirds of all the data transmitted in Canada," he stated.

"Datapac 3304 will provide these customers with lower communications costs, better utilization of computer resources and the reliability of the Datapac network," the source maintained.

The service is intended to support multileaving terminals with little or no changes. Terminals will be connected to the network via a Network Interface Machine (NIM), which supports the multileaving protocol and converts blocks of data to packets or vice-versa, the spokesman explained.

Transmission speeds of 2.4K, 4.8K, and 9.6K bit/sec are reportedly available for each dedicated Datapac 3304 access line.

Two methods of host interface will be provided to allow customer flexibility in interfacing their computer with the network, the spokeman asserted.

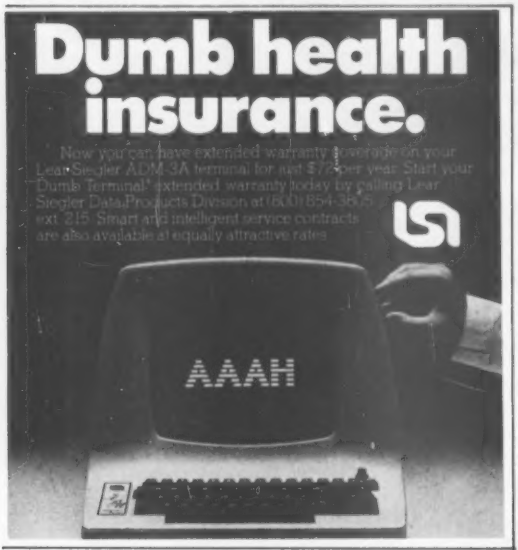
With the first method, transparent communications may be established between an RJE configuration and a host without modifications to the customer's equipment, software or operation, he said.

Under this scheme, a NIM-supported, dedicated Datapac 3304 synchronous access line is connected to the network from each host port or RJE terminal.

The second method allows nontransparent communications using the Computer Communications Group's X.24-compatible Standard Network Access Protocol.

"Nontransparent" service refers to customers whose host subscribes to Datapac 3000 access and whose terminals subscribe to Datapac 3304, he explained.

TCTS' Computer Communications Group is based on the 12th floor at 160 Elgin St. Ottawa, Ontario, Canada KIG 3J4.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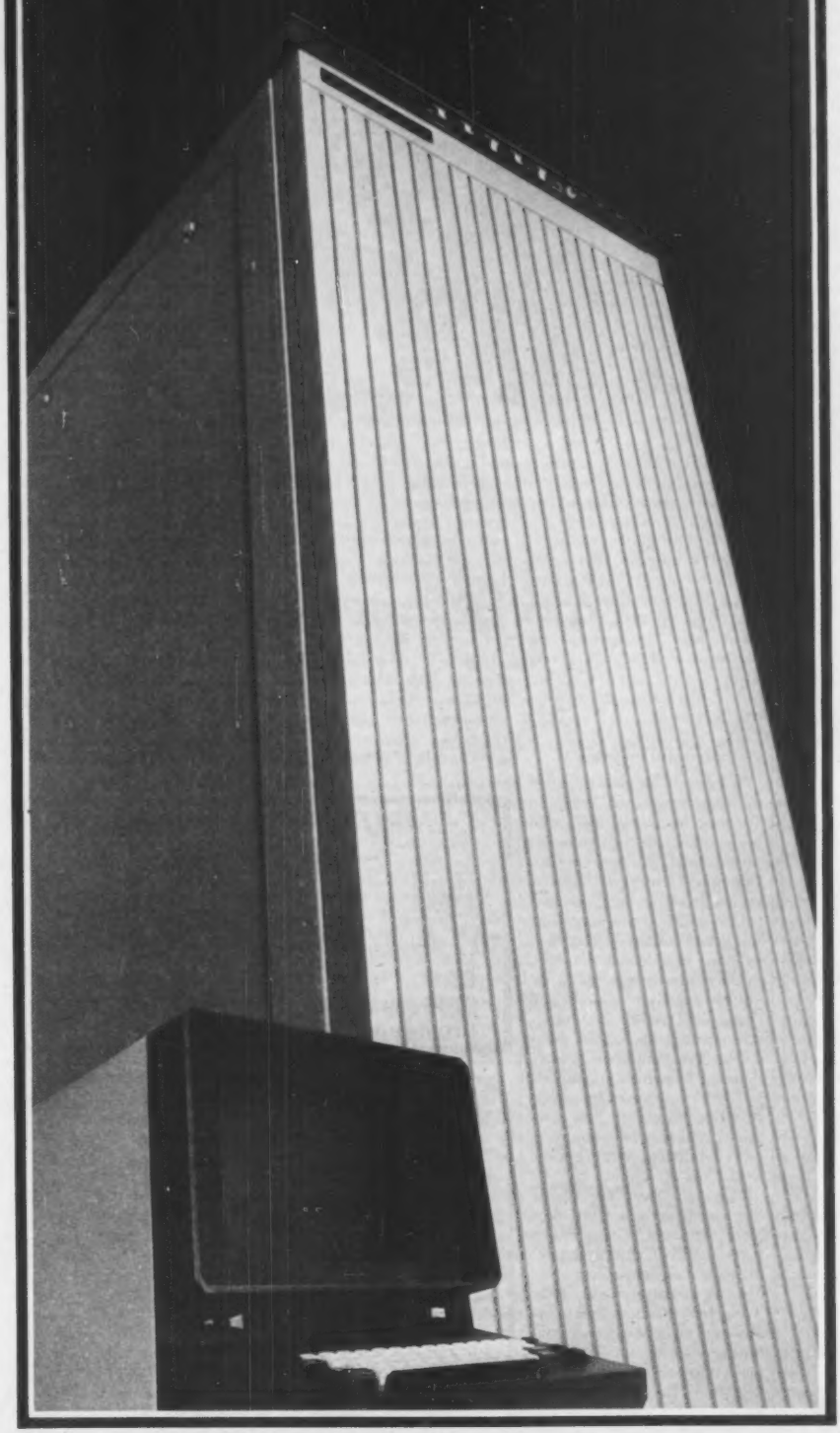

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'Newsweek' Net Gets Stories Into Print Faster

By Jay Woodruff
CW Staff

NEW YORK — *Newsweek* magazine has established a more reliable communications network to get stories from field reporters and bureaus to its headquarters here in time for publication.

On top of having higher communications speeds and being easier to use than the previous network, the present system uses backup communications lines in case the main lines fail, according to John (Woody) Lovrich, *Newsweek*'s assistant chief of communications.

Domestic communications are based on General Electric Co. Terminet 30 and Terminet 200 teleprinters connected over dial-up phone lines.

They are used not only to send stories from seven U.S. bureaus to New York, but to relay stories sent in from reporters who use portable terminals for transmission.

Further, according to Communications Chief Bob Monterola, the New York office uses its terminal network to receive story suggestions from reporters and to transmit assignments.

Newsweek had been getting along until 1978 with aging Telex machines made by Siemens Corp. for most of its domestic and international traffic. Problems caused by the teleprinter's great age (as teleprinters go) and slow printing speeds were compounded by the fact that only three data communications lines were available.

"We had two private lines and Telex machines in our New York wireroom, and we were limited to transmission speeds of 100 and 66 words a minute. At the end of the week, when we work around the clock to close the magazine, the bureaus were competing for use of the three data communications lines to headquarters," Monterola recalled.

The aged machines were "faithful and would rarely break down," Lovrich added, but if they did, parts were hard to find.

Photo by David R. Friedman

Newsweek's chief of communications, Bob Monterola, checks a story assignment that will be sent out from the New York headquarters to one of the magazine's news bureaus.

Successful Experiment

Newsweek began to change its communications setup in 1978 by installing, on a trial basis, 30 char./sec Terminet 30 terminal printers in Chicago and New York. The experiment was judged successful, so the magazine installed a total of 11 terminals, modified to print double-spaced copy, in the domestic bureaus.

Subsequently, five 120 char./sec Terminet 200 terminals were installed in New York, Washington and Los Angeles to permit 1,200 bit/-sec service among these traffic-heavy locations. The Terminet 200s are also used to receive reporters' copy from the field.

Data sent over the phone lines from the reporters' portable terminals is captured in the Terminet 200's buffer memory, Lovrich said.

In Washington and New York, full-time terminal operators are responsible for transmitting news assignments, news copy and other communications through the network. At the rest of the bureaus, one person is designated to run the machines.

"Some of the reporters who wouldn't touch the old terminals will type their own copy on the Terminet units if they come in after hours and the office manager has gone home," Monterola added. "Since it feels almost like an electric typewriter, it's an easy machine for them to use."

Each terminal ordinarily uses dial-up lines offering transmission speeds up to 30 char./sec when communicating with another terminal, but a second port connected to a Western Union, Inc. switch circuit is available as a backup.

To further enhance its communications resources, the Washington bureau uses two Applied Digital Data Systems, Inc. 520 CRT terminals for preparing magnetic cassettes off-line. It uses the Terminet 200 only for the short time it takes to send the contents of the cassette tape to the receiving terminal in New York.

Since quick communications between headquarters and Washington is critical, *Newsweek* saved dial-up time by installing a multiplex line from New York to the *Washington Post*, then "legged off" a local loop to *Newsweek*'s Washington bureau. Both publications are owned by the Washington Post Co.

Last year, the New York office set up a channel from a Terminet 200 to the *Washington Post* that is then put on a Westar communications satellite to a Los Angeles earth station and routed from there to the magazine's Los Angeles bureau.

International news coverage causes the newsweekly to rely heavily on the British Post Office's (BPO) International Telex Lease Message Switch. Both *Newsweek* and the *Post* share office space in Europe, although each communicates separately to the BPO over ITT leased lines.

All the European bureaus are listed in the Telex address library. Traffic is sent on a Teletype Corp. Model 28ASR at 100 word/min from New York to the BPO. There it is sent over the Telex to the Bonn office.

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SYSTEM / Characteristics	IBM 3031	NAS AS/7000N	IBM 3032	NAS AS/7000	IBM 3033N	IBM 3033	NAS AS/7000 DPC
Relative Performance	54	105	124	143	192	223	230
Memory Size in Bytes	2M-6M	2M-8M	2M-6M	4M-16M	4M or 8M	4M-8M	4M-16M
Purchase Price Memory Size	$684,000 (2M)	$1,100,000	$1,392,000 (4M)	$1,525,000	$1,550,000 (4M)	$2,620,000 (4M)	$2,350,000
Monthly Lease (Lease Term)	$24,410 (4 Years)	Not Available	$48,220 (4 Years)	Not Available	$51,280 (4 Years)	$71,500 (4 Years)	Not Available
Memory Cycle Time (Nsec)	345	Not Available	320	Not Available	Not Available	285	Not Available
Machine Cycle Time (Nsec)	115	72	80	72	57	57	Dual Processor 72 Each
Channels (Min-Max)	6	6-8	6-12	8-16	6-12	12-16	12-16
Cache (Buffer) Size	32K	16K	32K	64K	16K	64K	64K
Price Per 1M Byte Of Main Memory	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000

An NAS spokesman said monthly lease rates vary on a customer-by-customer basis.

NAS Aims CPUs at IBM 30-Type Sites

By Tom Henkel
CW Staff

PALO ALTO, Calif. — The Advanced Systems (AS)/7000 line announced earlier this month by National Advanced Systems (NAS) is a three-model family of mainframes designed to compete with IBM's 30 series [CW, Jan. 14].

A revamped version of Itel Corp.'s AS/6 mainframe line, the AS/7000 series marks the first product release from NAS, the company formed when National Semiconductor Corp. took over Itel's Data Products Division in October.

Although the names have changed, the marketing scenario will stay the same. The AS/7000 processors are made in Japan by Hitachi, Ltd. and sold by NAS.

The three-model family offers a better price/performance ratio, expanded channel and main memory capacity but a larger price tag than the 30 series.

The AS/7000N, a basic processor, is a 2M-byte, six-channel unit expandable to 8M bytes and eight channels. NAS claimed the AS/7000N offers 1.8 to 2.2 times the throughput of IBM's 3031.

The AS/7000 is a slightly larger machine comparable to the IBM 3032. It can be used as a 4M-byte, eight-channel system or expanded to 16M bytes and 16 channels.

The top-of-the-line AS/7000DPC is NAS' answer to the IBM 3033. It is a dual processor with throughput equivalent to a 3033 when operating under MVS or VM370, NAS said.

Users can order the AS/7000DPC as a 4M-byte, eight-channel basic complex from NAS or field-upgrade to it from the AS/7000. AS/7000DPC can be expanded in the field to 16 channels and 16M bytes.

Deliveries of the systems are scheduled to begin in the second quarter. The basic AS/-7000N configuration is priced at $1.1 million. An AS/7000 with 4M bytes and eight channels costs $1,525,000 and the basic AS/7000DPC configuration with 4M bytes and 12 channels costs $2,350,000.

Add-on memory comes in 2M-byte increments and costs $100,000. Optional features include a four-channel I/O processor for $175,000 and a second console for remote operations or further redundancy for $20,000.

Barge Line Can Always Pinpoint Its Fleet

JEFFERSONVILLE, Ind. — The American Commercial Barge Line (ACBL) here uses a unique system to keep track of its fleet of 2,000 barges and 60 towboats on 15,000 miles of inland waterways.

With the current emphasis on saving energy, increasing attention is being paid to the use of barges to haul commodities. Many believe this form of transportation is the most economical and fuel-efficient of all present modes of transportation.

ACBL, together with subsidiaries Jeffboat and American Commercial Terminals, operators of cargo terminal facilities, comprise the Inland Waterway Services Division of Texas Gas Transmission Corp. Currently the company is moving more than 20 million tons of various commodities, including coal, grain, liquids and rock salt ores, each year.

The on-line towboat and barge locater system is implemented on a Univac 90/80-3 computer system to which 65 Uniscope 200 and UTS 400 CRT terminals are connected. The terminals are distributed between the Jeffersonville headquarters and regional offices in Chicago, Pittsburgh, Louisville, St. Louis, Cairo and New Orleans.

The 90/80 system has a main storage capacity of 2M bytes and additional mass storage of 800M bytes on eight Univac 8430 disk units. The system also includes six Uniservo 14 magnetic tape units, two printers, a card reader/punch and a communications subsystem.

Unlike other barge companies, ACBL owns its entire communications system and maintains a radio station, WFN, here. WFN is capable of communicating with towboats as far as 1,500 miles away.

In operation, towboat captains report six times daily via radio to WFN. Their reports include operational data including barge drops and pickups made since their last radio contact. The radio operators at the station input all messages received into the computer's data base via Uniscope 200 terminals.

Similarly, their instructions to the captains with new scheduling and routing information are also input to the computer on the terminals in the dispatching and operating areas.

The computerized ACBL information system transmits to each regional office all information about the company's boats and barges in that region and stores all information as permanent records.

The individual area dispatchers at ACBL headquarters receive the current status reports from the captains via their terminals. In addition, they telephone all customer facilities in their region to learn what requirements or activity changes have developed since their last contact.

This information is also entered into the computer to serve as permanent records for use by the dispatchers for scheduling.

First for Barges

C. Donald Peters, director of management information systems for ACBL, noted that the company was the first barge line to develop a locater system for its vessels. "From the information we receive from the system, we're probably ahead of anybody else in our costing system. We can pinpoint the most profitable areas of business and likewise determine those sources where the business is unprofitable or only marginally profitable," he added.

Using the terminals, ACBL personnel can zero in on any particular towboat or barge in the fleet, find out where the cargo was loaded, where it is, the weight and type of cargo being carried, when it left the last terminal, its estimated time of arrival at its destination and where it is to be discharged.,

A history of a barge's movements for 120 days can be assessed from the data base. In total, about 35 separate formats relating to the towbarge/barge traffic can be obtained on the CRT screens.

Customers who inquire by telephone about the status of their cargoes can be handled by service personnel who bring up the appropriate format on the screen. All the operators need from the customers is the barge number.

"When we had a manual system, it could take five minutes to locate the paperwork," Peters recalled.

The locater system was originally developed on two Singer minicomputers and an IBM 370/125. Because of a need for greater power and capacity, ACBL acquired a Univac 90/60 in 1976 and upgraded that to the present 90/80 processor in 1979. Since the locate system was started, transactions have tripled.

"The 90/80 system and the Data Management System 90 have proved to be ideal for our purposes," Peters said. "It's the best product I've run into and we've been averaging a 99% uptime on the system.

"We've found it an easy system to teach people to use, especially for on-line programming, and it has very good flexibility and recoverability features. The on-line program development has really increased the amount of work our development and maintenance staff can do. At the very minimum, it has made our programmers 25% more efficient," he added.

Overcoming International Restrictions

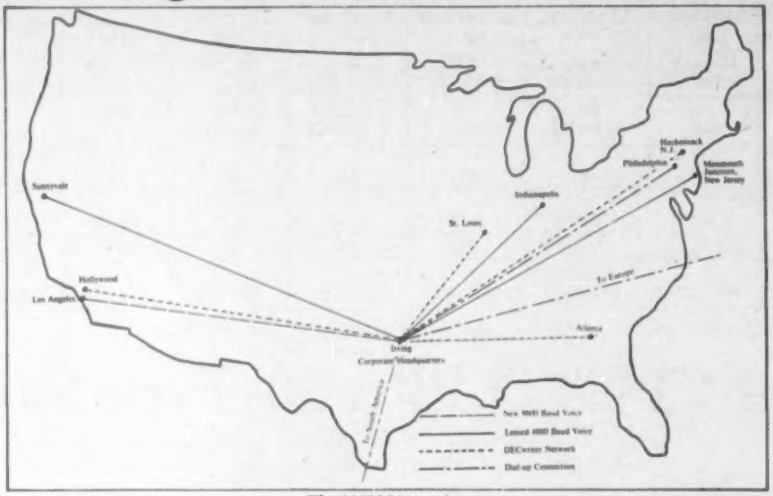
U.S. Firm Configures DDP for European Offices

Special to CW

IRVING, Texas — Establishing a dispersed data processing network in Western Europe can present problems, even for a corporation with extensive experience in data communications and field DP activities.

NCH Corp. (formerly National Chemsearch Corp.), a chemical distributor and manufacturer here, is using dispersed DP systems from Datapoint Corp. to provide its international sales offices with effective data processing and communications capabilities.

This accomplishment did not come about easily. When the time came to implement an international computerization program for its European subsidiaries, company DP and communications executives discovered that the systems and configurations that worked well at home were not necessarily applicable to foreign environments.



The NCH Network

Among the many obstacles that had to be overcome were (1) varying governmental and business requirements from country to country, (2) international restrictions on telecommunications and (3) national control of out-of-the-country transfer of business information.

In its domestic operations, NCH's accounting and data communications programs are highly centralized. Accounting routines for domestic branch operations are standardized, necessitating little or no intermediate on-site processing.

Source data is simply sent from field collection points via remote on-line terminals to Irving for processing on a central mainframe, after which necessary documents and reports are returned to the branch offices to expedite picking, shipping and billing.

In Europe, however, a comparable centralized operation is not practical — in fact, not even possible — because the NCH must contend with varying governmental regulations and business requirements.

Domestic Configuration

In the U.S., NCH runs a large-scale computer operation at its corporate headquarters building in Irving, a suburb of Dallas. The company has been using an IBM 370/148 as its main processing resource since June 1977.

This system incorporates a 2M-byte central memory, 11 tape drives and 12 disk drives with over 3.8G bytes of storage capacity.

The configuration also includes two Documation, Inc. 2,250 line/min printers, one Documation 1,250 line/min printer, a card reader and a card punch. This system runs under the umbrella of VM/370, with OS/VS1 the "bread and butter" suboperating system.

Other important systems are the Customer Information Control System (CICS), the Conversational Monitoring System (CMS) which is used for on-line programming development and debugging, and APL, which is used for financial modeling, projecting and forecasting.

Nearly all home office processing is accomplished on the 370 system. Local access to the system is achieved under a CICS installation through approximately 50 3270 terminals, located in the headquarters building and linked to the central mainframe.

Other NCH facilities in Irving and across the country have remote 3270 systems with a total of 30 terminals accessing CICS and the 370 configuration.

At present, the company is also utilizing, in Irving, a Datapoint 6600 CPU in a Datashare system supporting four Datapoint 3600 CRT workstations, two mass storage disks and a 300 line/min printer.

This configuration is being used for a recently developed accounts payable and general ledger application and will soon be upgraded to a Datapoint Attached Resource Computer (ARC) system. The present system offloads a portion of the processing burden from the 370/148.

Remote Links

To transmit shipping and inventory data from the field, the company utilizes Datapoint Four-Phase data terminals using IBM 3270 communications protocol in its three manufacturing plants and warehouses.

Through optional software, the configuration can function as a key-to-disk remote job-entry unit and as a 3270 simulator for data transmission.

Locations of the facilities are Sunnyvale, Calif., Indianapolis and Monmouth Junction, N.J. Communications occur in bisynchronous protocol.

The California and Indiana offices are linked to the home office via a 4.8K bit/sec, voice-grade line leased from Southern Pacific Communications Co. (SPC). Connection from the New Jersey site to Irving is achieved by a 4.8K bit/sec telephone line leased from AT&T.

To implement the leased lines, the local phone company provides local loop service to complete the connection. In the near future, the company plans to upgrade these lines to 9.6K bit/sec.

Besides these directly operated sites, NCH has a communications link with its plumbing supplies subsidiary in the Los Angeles area, P&M Manufacturing, Inc., which also has on-site a Four-Phase IV-40 system.

Communications to the Los Angeles operations is achieved via a 9.6K bit/sec SPC voice-grade leased line.

Most data communications

(Continued on Page 54)

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Like Moving From VW to Race Car

Bank Goes From 360 to 470, Drops 3033 Order

MEMPHIS, Tenn. — Union Planters National Bank, with assets of $1.06 billion, feels like it moved from a Volkswagen to an Indianapolis race car since it upgraded from IBM 360 equipment to an Amdahl Corp. 470 V/7 mainframe.

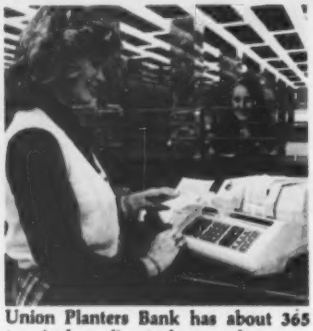
"The 470 enables us to provide our customers with 24-hour banking services in their own backyards," Senior Vice-President Robert E. Weir said. "It also saves us money by providing information that allows us to react to the market more quickly and to stop fraudulent transactions as they begin."

According to Weir, a typical example of the system's improved operating capabilities is a key management report that formerly required four and a half hours to process. That report is now printed in 55 minutes. Moreover, the computer's response time to terminal requests has dropped substantially, from 20 to two seconds.

Union Planters, founded in 1869, served primarily commercial and agricultural accounts until the early 1970s, when a major reorientation toward customer accounts occurred. Although the bank retained its commercial and agricultural accounts, it initiated a serious bid for retail business — primarily checking, savings and installment loan types of accounts.

Backyard banking is one of Union Planters' features. Here a customer makes a deposit in a neighborhood ATM, which the bank calls 'Annie.'

When Union Planters introduced automated teller machines (ATM) in 1975, it was using two IBM 360/65s for all its computer needs. The natural growth of the bank and the addition of approximately 27 more ATMs over the next three years pushed the IBM system to its maximum limits.



Union Planters Bank has about 365 terminals on-line 24 hours a day.

"It was like trying to run the Indy 500 in a Volkswagen," Weir recalled.

Union Planters had an IBM 3033 on order to replace the two old machines, but extensive testing revealed that Amdahl's 470 was "head and shoulders above any other equipment available," according to Weir.

The chief advantages included a much higher operation speed, a cooling requirement one-third less than that of comparable systems, a cost equivalent to the old IBM system and a high degree of reliability.

The Amdahl 470 was installed in the fall of 1978 in lieu of the IBM 3033.

CIF Centralizes Data

Computer contact with a new customer is immediate. When an account is opened, all information provided by the customer goes into a Central Information File (CIF), where it is available for future transactions such as installment loan applications.

The CIF enables the bank to make loans and other transactions quickly. All information and requests coming from the computer flow into the CIF, resulting in current information being on-line 24 hours a day.

The CIF also makes life easier for the customer. If, for example, a change of address occurs, one phone call will make the change on all checking, savings and loan accounts.

A debit card is the key to the backyard banking. The card is issued at the customer's request when the account is opened, enabling him to take advantage of the 425 terminals, on-line 24 hours a day in local shopping centers and markets.

Check factoring allows the customer to cash personal, government or payroll checks at any local supermarket having a point-of-sale device (POS). The debit card and check are inserted into the machine, and an endorsement is stamped on the check, which is then presented to the grocer and cashed.

Electronic funds transfers are handled by the ATMs. By inserting the debit card, a customer can transfer money from savings to checking or make his Master Charge or loan payment.

"Up Shopping" is a special feature that allows the debit card to be used as a credit card in local department stores. The debit is drawn against the customer's checking account as opposed to a line of credit, but the need to present a driver's license and credit card is eliminated.

Union Planters also provides for its customers beyond their backyard. Eight ATMs are franchised to local banks in Mississippi, Arkansas and other parts of Tennessee, allowing Union Planters customers to take care of banking needs when visiting any of these areas.

Besides saving time for Union Planters, the 470 also saves money. According to Weir, operating capabilities have increased by a factor of 8, while costs have remained at the 1975 level. The CIF enables the bank to negate fraudulent transactions before any money is lost, because account information is "on-line" 24 hours a day.

The 470 has been down only three times since its installation in September 1978. The computer's own diagnostic capabilities take care of most problems within minutes.

If a failure occurs, the minicomputer within the computer examines the circuits, then displays the internal logic information on the console display. The engineer can determine the exact location of the problem and replace the fault module.

The 470's capacity of 16M bytes of memory and 16 channels enables it to grow as Union Planters' services expand.

The Union Planters 470 V/7 now has 6M bytes of memory and 12 I/O channels. The software is IBM's MDS and IMS/VS, supported by Amdahl.

An IBM System/7 serves as a front-end communications controller for the 100 point-of-sales devices, while the 40 ATMs and 225 teller terminals feed directly into the 470. One hundred and twenty CRTs located in the bank's operational areas allow customer services personnel to enter or extract information within two seconds.

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DP Dialogue

Notes and observations from IBM that may prove of interest to data processing professionals

A Bank That "Borrowed" From the Airlines

Online banking and airline reservation systems both must handle high volumes of short transactions. So when Western Bancorporation designed its online network, it chose as its operating system the Airlines Control Program (ACP).

"The capabilities of ACP fit our transaction stream beautifully," says Clayton W. Jackson, senior vice president of Western Bancorp Data Processing Company, a subsidiary of the bank holding company. "We find that ACP uses our host computer very efficiently."

Western Bancorp is an affiliation of 22 banks in 11 western states. As its first project, the subsidiary managed the conversion of the group's 22 diverse DP centers to the unified network.

Within this network, two independent data communication systems were set up. One consists of 3,663 teller terminals (IBM 3604 Keyboard Displays) in 810 branch locations, using System Network Architecture (SNA). The other is a bisynchronous network linking the DP centers for data collection.

At the center of the network, IBM 3705 Communications Controllers manage data traffic to and from 320 IBM 3601 Finance Communication Controllers distributed over 11 states. Yet the host computer in El Segundo, California, the headquarters of the data processing subsidiary, is only a System/370 Model 148.

According to Jackson: "Within six months, we built this data center, developed the system, and started it up in the first 21 branches, as a joint effort with IBM. We could not have come close to that without SNA."

Under SNA, most of the detailed communication programming for a teleprocessing system is eliminated.

Plans call for the use of the Advanced Communication Function (ACF) of SNA for computer-to-computer communications, Jackson adds. "A customer will be able to go to any office to draw money, and the teller's inquiry at the terminal will automatically be routed to the appropriate data base to determine if funds are available."

ACP serves a variety of financial, hotel, and other users with high-volume online applications, as well as many airline reservation systems. "With all these ACP installations," Jackson notes, "we know it works, is reliable, and has the positive recovery we need for handling money."

A teller in a Western Bancorp branch in any of 11 states can access the data base in any other branch through a terminal. The Airlines Control Program (ACP) enables a relatively small host computer to handle very heavy transaction traffic.

VM/370 Gives Lift Truck Production a Boost

"This plant is committed to online production control by the computer," says Dave Van Duyn of Allis-Chalmers Corporation. "All its operations, and the movement of materials on the manufacturing floor, absolutely depend on it."

To insure uninterrupted data processing service, the company's Industrial Truck Division, headquartered in Matteson, Illinois, uses Virtual Machine/370 (VM/370) in its IBM System/370 Model 138. VM/370 is a system control program under which one real computer simulates several functional machines. It appears to the users of each virtual machine that they have an apparently free-standing computer, logically separate and dedicated to their application. No one virtual machine can be affected in any way by activity in any other.

"Availability is the key benefit of the virtual concept," Van Duyn adds. "I can't remember the last time a system problem affected production." He is manager of data processing and systems for the division, which manufactures fork lift trucks.

At Matteson, where engine-powered trucks are made, the production control system processes order entry, material requirements planning, inventory control, shop order release and production scheduling. It responds to inquiries regarding customer orders and shipment schedules, inventory availability, and production performance.

At the same time, other end users are running online applications in other virtual machines. Engineers access the Conversational Monitor System (CMS) to do interactive computations. Users at an Allis-Chalmers plant in Lexington, South Carolina, where electric vehicles are made, access their own virtual machine through an IBM computer. And the data processing department does interactive programming under CMS.

"Having a virtual machine dedicated to program test is particularly valuable," Van Duyn notes. "It completely isolates production work from anything that happens in an unverified program.

"As a point of interest, I have defined a virtual machine for some purposes of my own. We have a lot of equipment traffic with IBM, and I monitor the delivery schedule and the invoices interactively with CMS. In the same virtual machine, we keep track of the locations of 60 online terminals and who uses each one. I also keep on file a current copy of the configuration of our backup site. And we do word processing under CMS for some of our system documentation."

Allis-Chalmers industrial lift trucks ready for shipment. This Matteson, Illinois plant depends on the online computer, so Allis-Chalmers uses IBM's VM/370 to help assure uninterrupted production.

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For Its European Subsidiaries,

(Continued from Page 50)

with these facilities occur through automatic polling features directed by special software routines incorporated into the CICS system.

The IBM 370/148 is front-ended with an IBM 3705 communications controller unit to accommodate up to 64 bisynchronous lines. It currently operates considerably below that capacity.

NCH utilizes Racal Milgo, Inc. modems with all of its data communications equipment, domestic and international.

Little Local Processing

There is little requirement for on-site computer expertise at each of these four remote locations. "Our philosophy in the U.S. is to manage our remote network using our home office mainframe," according to Stuart Walker, domestic systems programming manager.

"The field offices are expected to enter the data into the system, but we don't want them to have to write programs. We have a central group here to do that.

"We don't want local offices bogged down in computer operation management. Their basic task is in the applications areas and the resulting data entry," Walker said.

The home office Systems and Programming Group writes programs for all the processors in the U.S. and South America and a portion of the programs for Europe.

For the company's network of branch sales offices, a teletypewriter network is utilized featuring Digital Equipment Corp. Decwriter units. These are located in Hollywood, Calif., St. Louis, Mo., Hackensack, N.J. and Atlanta.

Communications is achieved via dial-up 300 bit/sec asynchronous telephone service. This net is used primarily for the transmission of field sales data. Plans are to ultimately integrate this subnetwork into the CICS operation.

Evolutionary Stage

"At the present time, communications for our field facilities are in an evolutionary stage," Walker noted. "We hope to establish a full domestic network management system so our facilities in Indianapolis, for instance, can 'talk' to our plant in Sunnyvale without going through Irving.

"This would simplify the process of switching inventory and manufacturing capacity to the channels where they can do the most good," he added.

NCH also maintains a data communications connection with a plumbing supplies subsidiary, The Creed Co., located near Philadelphia. This is currently a 2.4K bit/sec, Bell dial-up link.

This organization, an acquisition by NCH, is currently utilizing an in-house IBM System/3 Model 10, with which it handles most of its data processing requirements.

Operating in the 3780 simulation mode, the System/3 unit is also used for data communications to interface with the 370 system for accounts receivable and accounts receivable summaries required by NCH corporate staff.

ARC Concept

NCH plans to replace the IBM System/3 unit in Philadelphia this month with a Datapoint Attached Resource Computer (ARC) system.

The ARC system will initially consist of three Datapoint 660 central processors, two Datapoint 3800 attached processors, one 600 line/min

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NCH Finds Special DDP Configurations Needed

printer, 120M bytes of mass disk storage capacity and ultimately as many as 16 Datapoint 3600 video display workstations.

"ARC is something of a departure from the centralized mainframe philosophy that guides us overall," Walker noted, "but in this case we expect the on-site advantages to outweigh any problems otherwise caused by this apparent inconsistency in management policy."

Operators at any workstation within an ARC system may have access to data stored in memory peripherals of any processor in the system. Access may also be restricted, if that is desirable.

International Move

When the time came to bring foreign subsidiaries more fully into the computer age, NCH executives discovered that conditions were substantially different from those in the U.S.

First, telecommunications across the various jurisdictions was often physically difficult or impossible; second, such transfer of information could often raise sensitive questions of national precedence and sovereignty.

These background considerations varied somewhat from NCH's experience in the U.S., where remote batch processing over large stretches of geography posed few political difficulties. This called for a different approach to the concept of data communications and equipment selection.

NCH decided on decentralization and independent computer operations for each European subsidiary. Each installation, unlike those within the U.S., would be capable of operating as an independent, stand-alone DP station, yet still would possess a data communications capability.

Emulating U.S. Formula

In the U.S.,the NCH computer and communications network has a number of critical functions to perform. One of the most important of these is on-line order entry.

The main tools utilized to accomplish this function are the CICS installations in Irving, which centralized the handling of orders for a considerable portion of the country.

The desire to emulate the domestic success in this area of order entry was another compelling factor behind the NCH push to offer independent processing in each national jurisdiction.

Otherwise, no alternative to multistep handling of order entry data based on distribution and warehouse facilities would be available to NCH in Europe.

What NCH desired was essentially a DP capability in its international offices that duplicated the one in the U.S. in terms of applications, if not in equipment.

And it has worked out that way. Applications handled on the Datapoint installations in Western Europe provide almost the same service as U.S. branches get from the Irving facility.

European Configurations

Currently NCH maintains in four offices of its European subsidiaries the following basic Datapoint equipment configuration: Datapoint 5500 CPU, eight 3600 workstations, one 600 line/min printer, two mass storage disks and one tape drive.

The sudsidiaries on the continent utilize dial-up telephone service to transmit summary information in a bi-synchronous mode to the subsidiary in Birmingham, England, which serves as a collection point for the parent corporation.

These subsidiaries use either 1.2K or 2.4K bit/sec lines, and the protocol normally utilized is Datapoll. In the future it is expected that some of the European subsidiaries will utilize a dial-up data communications connection direct to the Irving facility.

The English computing facility connects to the Texas home office via a dial-up 2.4K bit/sec line. NCH is doing experimental transmission of data between Birmingham and the U.S., which eventually may result in a formal schedule of data communications between these two locations.

Self-Sufficiency

The overall NCH plan is for its European subsidiaries to be as self-sufficient in their DP requirements as possible on a daily, weekly and monthly basis.

Most locations have already reached the point where only a small amount of month-end processing is done in England on the IBM 360/30 and the companion Datapoint configuration.

About 70% of the programs used by the subsidiaries are Databus, the remaining 30% are in Cobol and utilized at the close of business each day to process all the information collected during the day.

NCH also expects that, by the end of 1980, it will have additional Datapoint Datashare installations at its facilities in a number of additional localities in Western Europe and South America. Those in Europe will furnish summary data through the English operation for retransmission to Texas.

"Our European data processing operation is a pragmatic adjustment on the part of NCH to the realities of that environment," an NCH spokesman said.

"We anticipate that, in due course, these subsidiaries will become integrated into the corporation's overall data network; but I doubt we'll ever 'push' technology at the expense of other important management and marketing considerations."

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Features for IBM 370, 30 Offered at Savings

By Tom Henkel
CW Staff

SCHAUMBURG, Ill. — Users of IBM 370 and 30 mainframes — can now buy — for rates that are reportedly 10% to 40% less than IBM's — such electronic features as channel-to-channel adapters, integrated storage controllers and performance improvement boosters directly from Circle Computer Services, Inc.

Circle, which formerly sold only to third-party CPU vendors, said it can deliver those features in a week. IBM takes up to nine months to deliver them, according to Randall Zwier, Circle's sales manager.

How can Circle do it? The company deals with many third-party vendors. When a user turns in a mainframe it leased from a third party, Circle reconditions the machine for the next user.

In the process, it removes and buys up all the extra little gadgets the first user had installed to customize his system. Circle squirrels away the features until someone else needs them, Zwier explained.

This type of features business has been going on in the third-party vendors' world for years. Since these vendors make money in mainframes, features often are an added expense that don't offer many of them an attractive enough profit margin, Zwier said.

Many IBM features are strictly electronic and unaffected by age, according to Circle, which is offering them at prices 10% to 40% less than IBM's. The savings vary according to the type of feature requested.

'We're Helping Out IBM'

Circle admitted its success in the new venture — it claims to be the first to offer such a service — depends heavily on IBM's willingness to allow feature installations in end users' machines. So far, when it comes to third-party maintenance, IBM has been willing to maintain systems with features installed by Circle.

Since Circle is a tiny ($10 million) company in comparison with IBM, Zwier said, he doesn't foresee Circle's business causing IBM any problems. If more vendors get into the IBM features business, however, IBM could retaliate by refusing to honor maintenance agreements of users that installed features through another vendor.

"Everything that we buy is IBM parts. We guarantee IBM will maintain these features. We have a very good working relationship with IBM," Zwier said. "With the late delivery positions, IBM would prefer to see some of those other 370 and 30 series equipment to be out there for a while.

"By having us provide some features, we're actually meeting IBM's philosophy. If the customer can't get the feature from IBM for nine months, he might want to kick out the machine, but if he can get it sooner, we're helping out IBM," Zwier said.

"All we have to do when we install the equipment is make sure it performs up to IBM's specifications and runs all the diagnostics. We have never had a problem with IBM."

Up to now, "95% of our business is coming from third-party leasing organizations. I would expect that to change [now that Circle is offering the same service to the end user]. It all depends on how many CPUs the leasing companies move," Zwier said.

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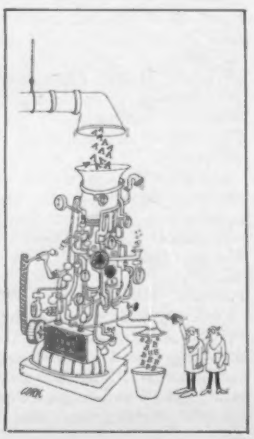


The Merging Of Telecommunications And Information Processing: The Technological Underpinnings

By Arthur H. Solomon

It is now generally accepted that the telecommunications and information processing industries are converging. A more questionable hypothesis is that competition is increasing among the participants in both industries for shares in what is supposedly becoming a single market. Some observers see a sort of showdown ahead in the U.S. between AT&T and IBM for utlimate supremacy in a merged industry. Industry structures in other advanced countries presumably will also undergo radical shifts, in keeping with the theme of integration of the two disciplines.

The underlying rationale for this line of reasoning comprises two main hypotheses:

- Modern information processing systems are relying increasingly on communications to share dispersed resources.
- Technologies employed in modern communications systems are largely adaptations of information processing technologies.

Therefore, the marriage of telecommunications and information processing stems from both user needs (data communications) and the implementation of the communications systems (digitial electronics and processor control). The two are certainly related. For example, in order to effectively handle user requirements for the transfer of digital information, the communications systems must have a compatible interface with the information processing hardware and software. Therefore, an understanding of information processing technology is important to the design of digital communications systems, and vice versa.

This interdependence is not, strictly speaking, a recent phenomenon. Concepts of information processing, or computing, were applied in telephone networks long before modern computers were practical. Dial pulse (digital) signaling to remotely controlled electromechanical step-by-step switching machines dates back to the early years of this century; later, storage and retransmission was introduced into electromechanical register-controlled systems using various forms of digital signaling.

The electromagnetic relay was introduced at about the time of World War I and offered new possibilities for automatic control. As such, it represented the incorporation of many of the principles of modern computer design. Relays were used in telephone switches in the late 1920s as bistable

(Continued on In Depth/2)

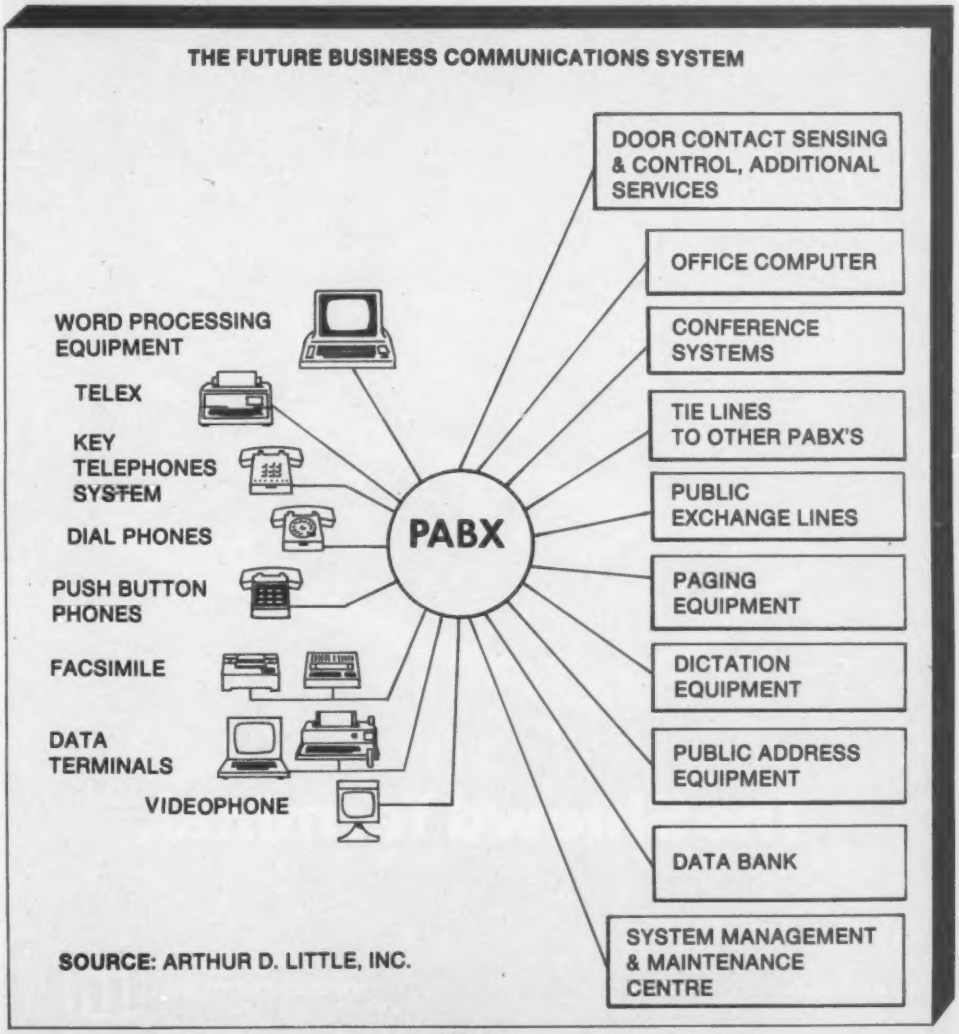


Figure 1

This article is excerpted from a talk given by the author at the Arthur D. Little, Inc. executive forum in international telecommunications, held Nov. 7-9 at Innisbrook, Tarpon Springs, Fla.

Entitled "Communications, Information Processing and the Productivity Revolution," the proceedings are available for $600 from Arthur D. Little, Inc., Acorn Park, Cambridge, Mass. 02140. Contact: Beverly Shackley.

IN DEPTH

(Continued from In Depth/1)

flip-flop circuits, which were forerunners of modern binary logic circuits. Boolean algebra was first studied in the 1930s for optimizing switching logic.

In addition, with the development of crossbar switching, emphasis was placed on the development of common control telephone switching systems, which establish successive call connections through a switching network. Common controls store, transfer, interpret, translate and gather information needed for establishing a network path and operate on information that is mostly in digital form. Common control crossbar switching systems were first placed in service in 1938.

At this time, work was under way at Bell Laboratories to design an automatic relay-type digital computer that used the new crossbar switch. By 1940, the first of Bell's so-called Complex Computers was placed in routine operation at Bell Laboratories. Interestingly, the motivation behind this development was to mechanize engineering calculations in the laboratory, not to control telephone operations. However, it was used in the first demonstration of modern data communications in 1940, when a teletypewriter in Hanover, N.H., was successfully linked to the computer in New York over a telephone circuit.

The history of digital transmission dates back to the invention of the Morse telegraph (a case might even be made that it originated with semaphor signaling or Indian smoke signals, but Morse must be credited with the first successful electrical system, which predated the analog telephone by some 30 years).

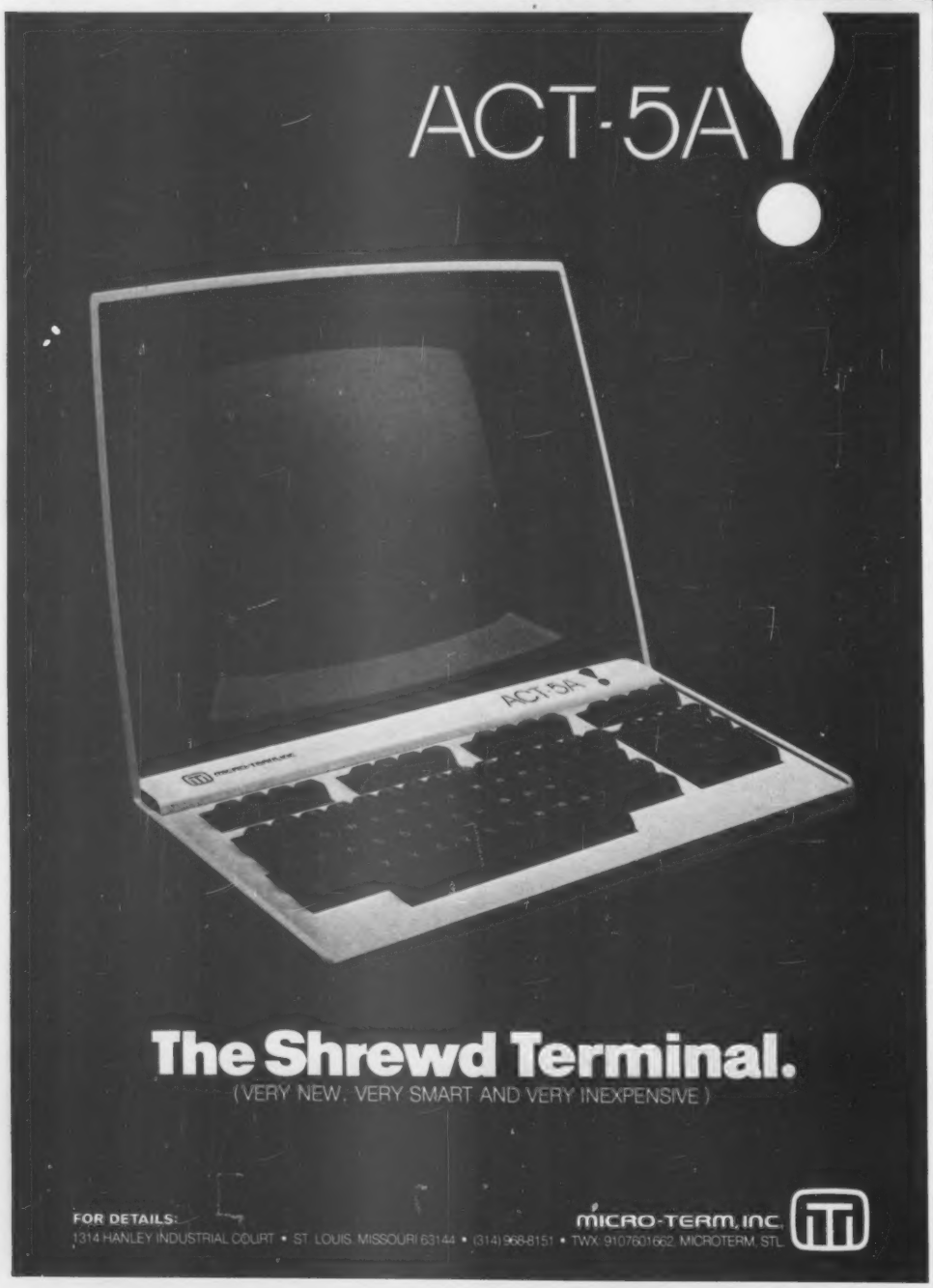
Roots of Modern Theory

However, the modern basis for digital communications was embodied in the pioneering work on communications theory that started with Nyquist, Hartley and others in the late 1920s and was carried on by many others in the '30s and '40s. By 1950, after the brilliant information theory formulations of Shannon and Wiener appeared, a sound basis was established for the development of both digital communications and digital computer systems.

Also by that time, von Neumann had conceived of the stored-program computer, which led to the development of machines capable of automatic successive computations, with logical decisions based on previous results. This greatly increased the speed and power of computers and relieved them of human intervention in the process of executing enormously complex computer programs.

The period from about 1950 is generally taken to be that of the development of modern computer-based information processing systems. Certainly, the most important single technical development that led to the phenomenal growth of the computer industry since that time was the invention of the transistor at Bell Laboratories, which led to the development of modern semiconductor technology and to the creation of an incredibly productive new industry by itself.

Both the information systems industry and the telecommunications indus-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try have since benefited greatly from semiconductor technology, but the former exploited semiconductor developments more dramatically and at a faster rate. This is largely because semiconductors came along during the embryonic growth phase of the computer industry, when it was in a very good position to adopt new, untried technology. By contrast, the telecommunications industry was already mature and had a huge investment in plant and equipment based on older technologies. It could not afford the risk of unreliable operation of early state equipment, nor could it rapidly replace older equipment with new solid-state systems even after they were proven reliable and cost-effective.

Solid-state information processing devices and systems therefore developed independently of telecommunications systems for many years, with the eager support of the semiconductor industry. Research and development of solid-state telecommunications systems continued in parallel, however, albeit in a lower key. The first all-transistorized digital transmission system was Bell's T-1 carrier system, which was first placed in commercial service in 1962. The first stored-program control switching system, using an electromechanical crossbar switching matrix, was Bell's 101 ESS PABX, introduced in 1963. The first all-electronic switching system in the world was the French Rita, a military digital system that was placed in service starting in 1968.

To carry the chronology of digital electronics and computer-based telecommunications systems further is not the purpose of this article. Rather, the purpose of this historical introduction is to show that:

- Information processing technology is deeply rooted in the history of telecommunications technology, and some of the most important antecedents of modern information processing technology came from early telecommunications-based research and development.
- Over the past 30 years, the information processing industry has stimulated rapid innovation in solid-state electronics and has forged a technological partnership with the semiconductor industry.
- The telecommunications industry was slower to absorb new solid-state technology than the information processing industry and so the former lagged behind the technological innovations promoted by the latter.

Current Trends, Future Scenarios

In the light of the foregoing discussion, the telecommunications industry would appear to be dependent for its innovativeness (and hence, its growth-producing new concepts) on the information processing industry and its partner, the semiconductor industry. If, then, the showdown were to come between AT&T and IBM, the former would be at a definite disadvantage.

To a certain extent, this is probably true. If user needs evolve rapidly towards multimodal business (and residential) systems, including local and distributed nonvoice information processing, as well as conventional voice and data communications, then companies skilled in computer and peripheral hardware and software technology may have competitive advantages over those less skilled in these areas.

Figure 1 on In Depth/1 shows the types of communications functions expected to be found in the business organization of 1990. To satisfy user needs 10 years hence, the communications supplier will find himself dealing in an expanded range of technologies, including many that stem from the information processing industry. Judging from the current behavior of many

(Continued on In Depth/4)

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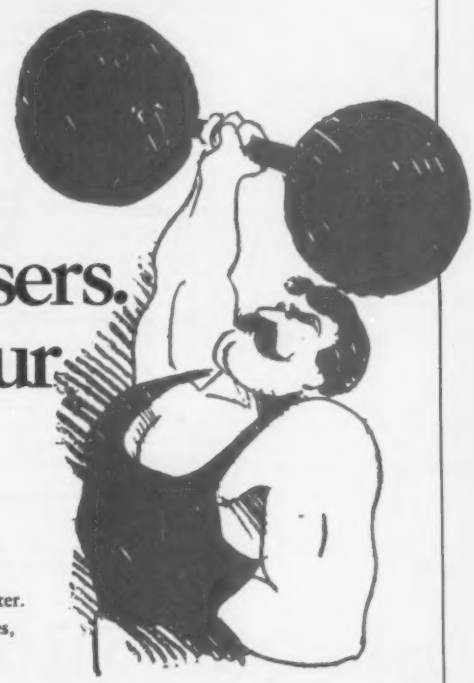

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IN DEPTH

TELECOMMUNICATIONS/INFORMATION PROCESSING MERGERS

Telecommunications Companies	Merged Technology	Implementation Strategy
ITT	Data Terminals	Acquired Booth Courrier
Northern Telecom	Data Terminals	Acquired Sycor, Data 100
	Network Software	Acquired Damray
	Voice/Data Switching	Developed Voice/Data Module for Digital PABX
AT&T	Intelligent Terminals	Developed Dataspeed 40/4
	Intelligent Data Network Service	Plans to Offer ACS
	Terminal Controllers	Offering Sykes Comm-Star under tariff
GT&E	Packet Switching	Acquired Telenet
Information Processing Companies		
IBM	Digital Network Service	Partnership with Comsat General in SBS
Xerox	International Record Carrier Service (Telex)	Seeking to acquire WUI
	Digital Network Service	Developing XTEN
NCR	Data Communications Hardware and Software	Acquired Comten
Datapoint	Computerized Telephone Cost Management	Developed Infoswitch

Source: Arthur D. Little, Inc.

Figure 2

FUNCTIONAL TELECOMMUNICATIONS/INFORMATION PROCESSING NEEDS

Inputs
- Alphanumerics
- Graphics
- Sensors
- Voice
- Video
- Digital signals

Outputs
- Hard copy
- Soft copy
- Actuation
- Voice
- Video
- Digital signals

Communications Functions
- Conversion (D/A, A/D)
- Protocols
- Error control
- Security
- Transport
- Routing

Processing
- Data
- Text
- Graphics
- Voice

Storage
- Data
- Text
- Graphics
- Voice
- Error control
- Security

Other
- Media conversion
- Mobility
- Integration of Functions

Source: Arthur D. Little, Inc.

Figure 3

(Continued from In Depth/3)

well-established telecommunications companies (both network service and equipment suppliers) who are investing in internal development activities in computer- and software-related fields, and/or acquiring other companies in these fields, it is clear that the telecommunications industry recognizes the need to expand its traditional technological base to include these technologies.

Similarly, many computer-oriented companies see the need to develop telecommunications capabilities to better exploit opportunities in office automation and teleprocessing.

We now have a viable scenario for the merging of telecommunications and information processing. It involves companies on both sides of the present boundary between the two fields each moving into contiguous market areas on the other side and developing (or acquiring) the needed technologies. Some illustrative examples are already in evidence, as shown in Fig. 2.

We expect further market-based technological merger activity in the future, especially in the U.S., in the light of current regulation and legislative trends which encourage freer competition and less regulation in the telecommunications industry. In other advanced countries, where many major suppliers already participate heavily in both telecommunications and information processing, the merging of technologies can take place more easily and less noticeably. Such companies may find opportunities in the U.S. increasingly attractive in the future.

Key Technologies

User needs, as shown in Figure 1, are the primary forces driving future telecommunications technologies. These needs may be expressed in terms of the functional requirements shown in Fig. 3. These, in turn, dictate the following as among the most significant areas for development:

- Processor hardware and software.
- Data compression techniques.
- Stored-program control digital switching.
- High-speed digital transmission.

These technologies embody concepts of both communications and information processing and illustrate the high degree of interdependence between the two.

Processor Technology

The current status of processor development covers a very wide range of characteristics, from simple microprocessors to huge, ultra-high-performance array and pipeline processors. Fig. 4 briefly summarizes the highlights of processor development since 1950.

Telecommunications-related processors characteristically consist of microprocessors and minicomputers for incorporation into PABXs, terminals, controllers, small business computers, file processors and data communications processors. Microprocessors have evolved as key components for implementing almost all classes of processors and, thus, will be the main item emphasized here.

The major current microprocessor types are characterized in Fig. 5. At the leading edge of the state of the art, microprocessor product lines are characterized by the following:

- Comprehensive families of 8- and 16-bit word length products feature fully integrated single-chip microcomputers for 8- and 16-bit word lengths; bus-oriented, multichip, virtual memory architecture, as well as complex instruction sets for 16-bit word length products; a significant proportion of software in firmware; and programmable I/O interface chips.
- High-end microprocessor perform-

HIGHLIGHTS OF PROCESSOR EVOLUTION

PERIOD	CHARACTERISTIC COMPUTING	ARCHITECTURE	PRIMARY ELECTRONIC HARDWARE	HARDWARE MODULARITY	PRIMARY SOFTWARE CHARACTERISTICS
1950-1958	Business/ Scientific Computation	Special purpose computers	Vacuum Tubes	Component Level	Machine Languages Subroutines Utilities Symbolic Assembler
1958-1964	Data Processing	General purpose computers	Transistors	Logic and other functions	High Order Languages, Monitors, Macro-Assemblers, Executives
1964-1970	Information Processing	General purpose Families, Multiprocessor, Multiprogramming, Minicomputers, Disk Systems	IC/SSI	Multiple Circuits	OS Multiprogramming Simulation Languages
1970-1979	On-Line Information Processing	Data Base Orientation, Networking, Distributed Systems, Microprocessors	MSI/LSI/ VLSI	Macro-Functions	Data Base Managers, Data Communications Managers, Transaction Process-Managers, Non-procedural Program Languages, Integrated Distributed System Managers

Source: Arthur D. Little, Inc.

Figure 4

ance is comparable to that of mid-range minicomputers (such as the Digital Equipment Corp. PDP-11/34). Further, the virtual memory architecture of the high-end products permits addressability comparable to that of most mid-range and many high-range minicomputers.

Toward New Applications

The late 1970s were characterized by rising user expectations for interactive computer-based systems to directly support the operations of a business. Some examples are distributed systems for process control, various aspects of electronic funds transfer, office automation and interactive graphics for engineering design support.

Within this broad communications-based distributed context, certain equipment types have become or are becoming more "intelligent"; current examples are the point-of-sale terminal (replacing the mechanical cash register), the intelligent copier/printer (replacing printers and/or copiers) and the word processor (replacing the typewriter). By now, the majority of potential applications for intelligent products related to the office environment have been at least identified, if not yet implemented.

However, the areas of greatest uncertainty are for multimode products (blending, for example, data, text and graphics processing) and multimedia information handling capabilities (combinations of alphanumeric, facsimile, video and voice).

The emphasis upon multimedia, interactive capabilities is a primary driving force for developments in interactive graphics, data base technology, image processing and voice processing.

Particular emphasis is placed upon related software and data base technologies. In the multimode realm, development of optimized software for integrated multimode operation is being actively addressed by manufacturers of business systems.

Improving Cost/Performance

Clearly, semiconductor technology is the driving force behind improvement of cost/performance for digital processors. Highlights of future cost trends are:

- Through the mid-1980s improvement in circuit density will continue at a comparable, but slightly slower, rate than the current rate.
- Very high volume for standard intelligent (programmable) electronics componentry will sustain current price reduction trends.
- Proprietary VLSI will be an important class of intelligent electronics componentry for certain specialized areas such as pattern recognition, voice processing and relational data base processing.

It should be noted, however, that presently the price of processors typically represents a small proportion (10% to 20%) of the product or system into which such a processor is incorpo-

(Continued on In Depth/6)

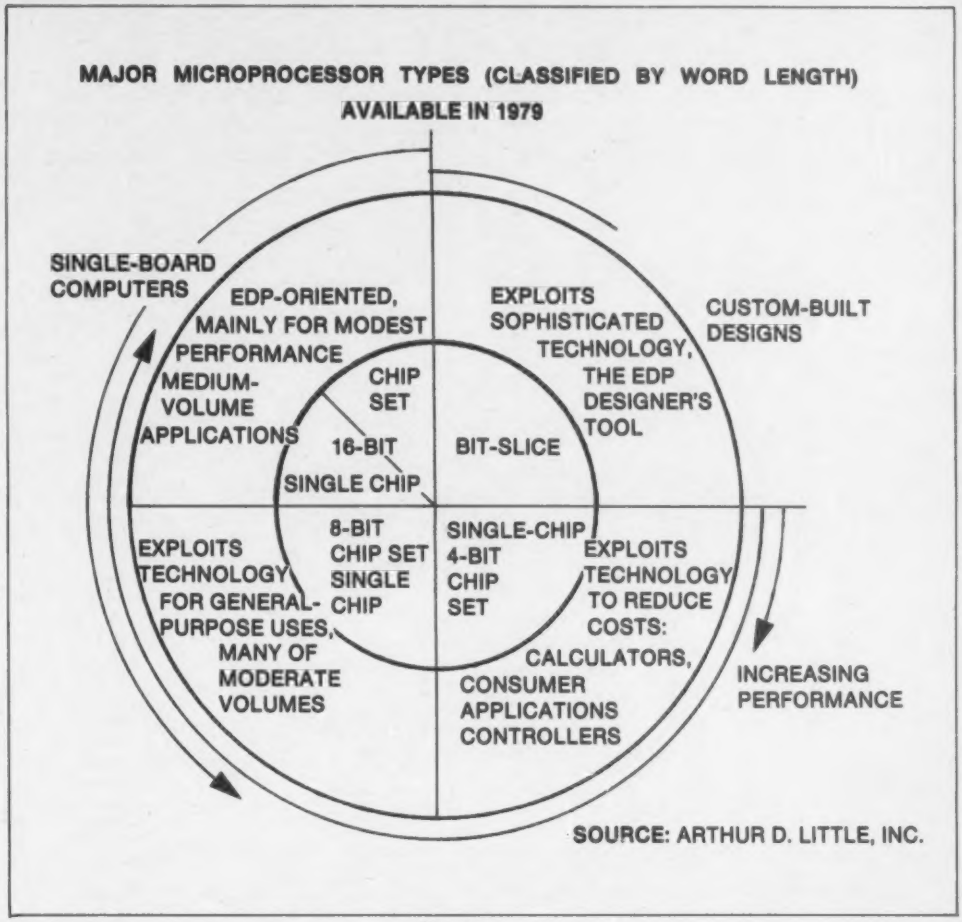

Figure 5

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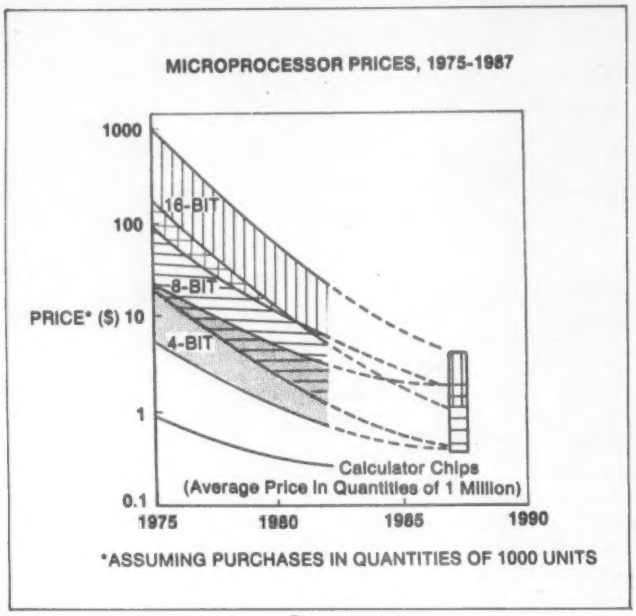

Figure 6

(Continued from In Depth/5)

rated. For some time now, performance and/or functionality improvements have been the primary benefits resulting from advances in the technology of semiconductor componentry. Microprocessors are projected to follow the cost curve of Fig. 6, 7, 8, while memory capacities and price per bit are projected in Figures 7 and 8.

Design Options

With these cost trends and the implied underlying increase in semiconductor chip densities, the range of options for processor designs will continue to expand. To date, we have seen the following options implemented:

- Longer word length: from four to eight to 16 bits.
- Expanded addressability via virtual memory.
- Architecture: 1M byte.
- Expanded instruction sets: minicomputer equivalent for 16-bit word length.
- Programmable I/O interfaces.
- Single-chip integrated processor, memory and analog digital converters.
- Higher level language-oriented instruction sets.
- System software, language interpreters in firmware.

During the next five-year period, we forecast:

- Word length up to 32 bits.
- Memory speeds enhanced by cache memory.
- Comprehensive incorporation of reliability, availability and serviceability features.
- Proliferation of functionally integrated, programmable I/O interfaces, including those for communications.
- Fiber optic communications interfaces.
- Incorporation of bubble memory storage.
- Higher level language-specific processors.
- Comprehensive use of system software, language interpreters and program development aids in firmware. Significant, but not comprehensive, implementation of application programs in firmware.
- A proliferation of two basic product types: integrated single-chip microcomputers; and comprehensive bus-oriented multichip microprocessor systems.

With regard to these two basic product types, the first will include not only general-purpose chips, but also a large proportion that will be application-specific. The second type will be equivalent in performance, at least, to the present full range of minicomputers. For larger scale systems, these hardware cost trends favor proliferation of the use of dedicated processors for communications and data base management functions. In general, these larger scale systems will be implemented by multiprocessor or multiple processor, microprocessor configurations which will facilitate functional, as well as physical, distribution of computing systems.

With regard to cost/performance figure of merit, broadly, we forecast a decrease of approximately 5:1 to 10:1 within the next five years. The principal R&D sponsors will continue to be the major computer and semiconductor firms. An added contributor may be some of the large data service firms who are now offering on-site minicomputers-based systems as extensions of their traditional data services. Further, the federal government, driven by lagging industrial productivity and national security considerations, may become more aggressive in its support of applied computer research during this period.

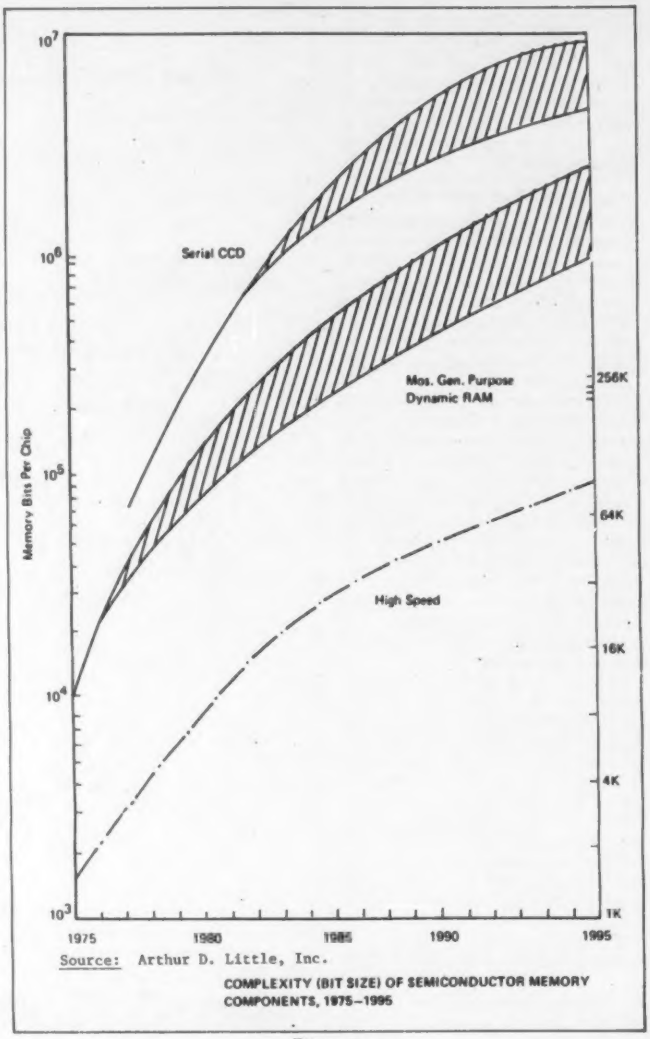

Figure 7

In the last few years, the emphasis in data compression has shifted from developing new techniques to software and hardware implementation of established techniques. This is because of advances in the technology of digital processors and digital storage devices which have resulted in dramatic reductions in the size and cost of digital memory and digital processing logic.

Development of fast, very large and inexpensive digital memory and digital logic has directed attention to more complex and more sophisticated techniques. These are mostly adaptive techniques that achieve better performance than nonadaptive techniques at the expense of more system complexity required by feedback loops and buffer control logic. Also, development of inexpensive full-frame memory and fast digital logic has allowed the use of sophisticated techniques for real-time coding of color TV based on frame-to-frame redundancy.

Future advances will most likely be based on evolutionary improvement of implementation rather than new theoretical breakthroughs. Following are examples of such improvement.

In voice compression, the present state of the art is intelligible but not very recognizable speech based on vocoder techniques at 2,400 bit/sec. Quite recognizable speech at 7,200- to 16,000 bit/sec is achievable by predictive coding.

By the mid-1980s, vocoders should be usable to 1,200 bit/sec and predictive coders at 3,600- to 4,800 bit/sec.

Generalized cost function predictions are shown in Figure 9.

In the area of television, full color NTSC TV meeting Bell System intercity standards can be accommodated in 16M- to 32M bit/sec using current state-of-the-art techniques. These rates may be decreased to one-fourth of this by the mid-1980s.

If one is willing to seriously degrade resolution or animation, considerable decreases in bit rates are possible, up to an order of magnitude. This limited-

IN DEPTH

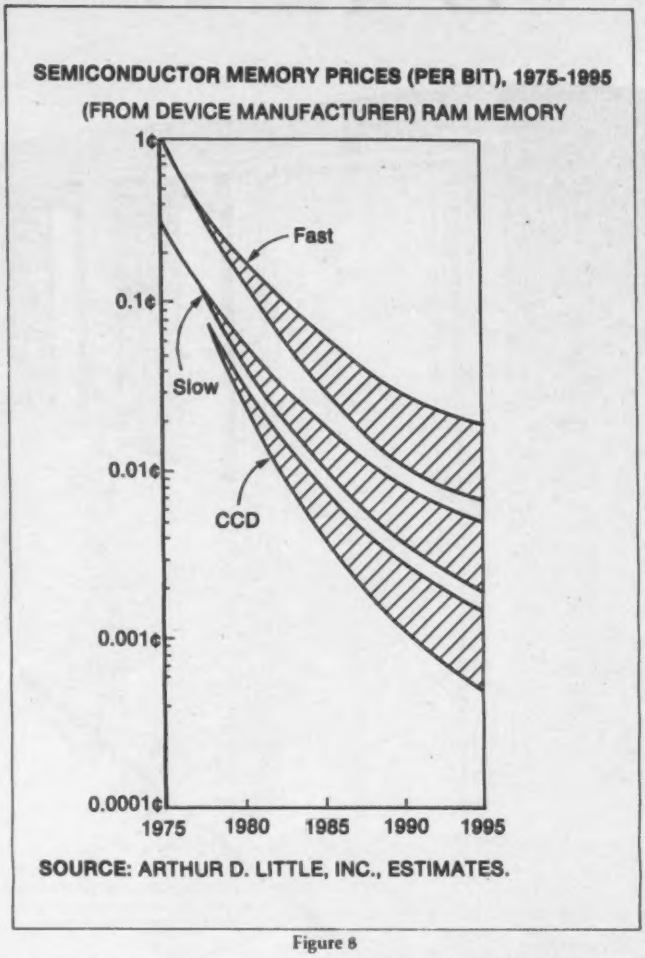

Figure 8

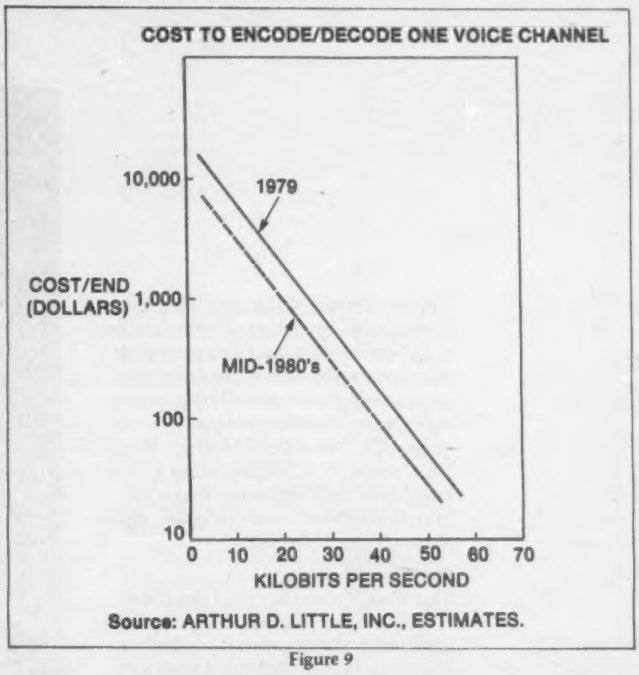

Figure 9

animation 525-line of full-animation low-line number picture may be transmitted at rates as low as that used in T-1 systems (1.544M bit/sec). These rates may be decreased to 250K to 500K bit/sec in five years.

Present digital facsimile rates are geared to 8-1/2-in. by 11-in. typed copy. Twenty-second performance at 9,600 bit/sec is now achievable (or 40 seconds at 4,800 bit/sec). Two-to-one improvements may be possible in the 1980s. Progress is gated by acceptance of universal standards presently under study by CCITT Study Group XIV.

Stored Program Control Switching

Virtually all "electronic" switching systems developed prior to the mid-1970s would be more accurately described as mechanical switching networks with electronic control. Such systems make use of space division switching where paths are set up between selected ports in a network of metallic contacts.

However, the last few years have seen an explosive growth of all-electronic switching systems. The most advanced of these use time division, which makes use of the fact that a continuous connection need not be established between input and output in order for the intelligibility in a band-limited signal to be transmitted. The fullest advantage of time division is exploited by *digital* switching in which the information in the connected sample is encoded into a computer-like digital word.

The impetus for digital switching is clear in a world where electromechanical and analog technologies are rapidly being replaced by digital large-scale integrated circuits (LSI). Many transmission problems have already been solved by digital techniques. For example, exchange area transmission is now dominated in developed countries by pulse-code modulation techniques. In pulse-code modulation, speech signals are converted into a series of instantaneous samples which are coded into digital words. These digital words are processed and routed using computer-based techniques.

Eventually the digital words are reconstituted into continuous analog voice signals. Voice signals transmitted in digital form afford many advantages such as regeneration, which prevents degradations from accumulating with distance. With signals in digital

(Continued on In Depth/10)

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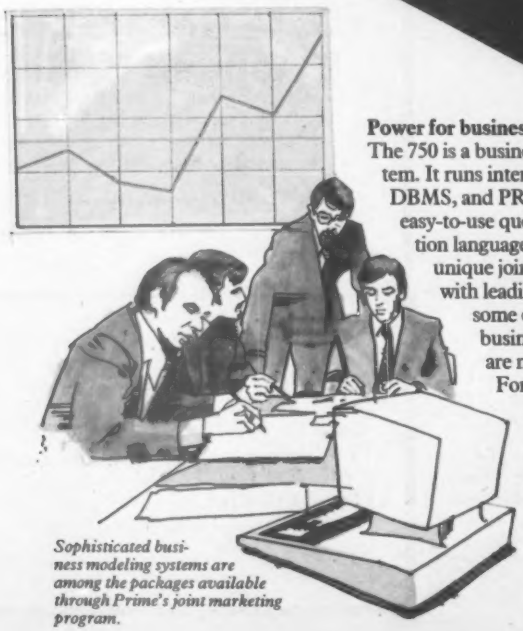

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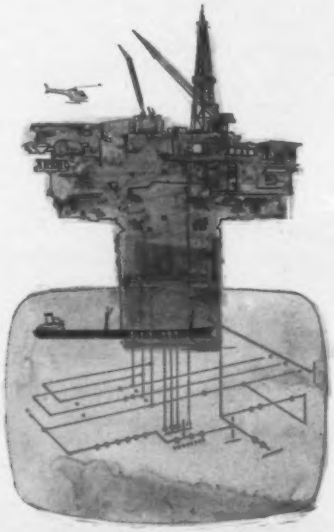

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Prime's extensive distributed processing software and compatible family of computers let you put computing power where it's needed.

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The 750 can also be a versatile building block in distributed processing networks, supported by one of the broadest ranges of distributed processing software available. PRIMENET,™ our networking software package, allows local and remote communications on private lines, and is X.25 compatible for domestic and international packet switching as well. In IBM 3270 environments, DPTX, our Distributed Processing Terminal Executive, provides smooth, no-risk transition to distributed processing.

Tools to get the job done
While it offers the ease of use and flexibility usually associated with small computer systems, the 750 is equipped with features that put it clearly in the mainframe class in performance.

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Advanced Prime engineering has made possible the 32-bit architecture and large virtual and main memory configurations that give the 750 mainframe performance capabilities.

One notable exception
With all that it can do, there's one thing you can't expect to turn over to the 750: a big chunk of your data processing budget. The 750 is priced substantially lower than mainframe computers of comparable capabilities, it's a lot less expensive to install, operate, and support, and you can get prompt delivery. All of which can make you a lot more versatile in allocating your financial resources to get your job done.

For more on what the versatile and powerful Prime 750 can do for you, contact the nearest Prime office, or write Prime Computer, Dept. 5310, 145 Pennsylvania Avenue, Framingham, MA 01701.

PRIME® Computer

(Continued from In Depth/7)

form, switching also becomes a straightforward function, based on a computer-like technology.

Another revolutionary development in switching is the rapid advance of stored program control (SPC). Until quite recently, it was thought that only very large exchanges were candidates for SPC. The remarkable growth of minicomputers and microprocessors has rapidly forced down the size of switch in which SPC competes effectively against noncomputerized control systems.

The basic function of a switching system is to connect two or more ports. Switching systems consist of three basic building blocks — a port interface, a control system and a switching network as shown in Figure 10.

- The *port interface* examines the ports for requests for service, provides ringing and signaling and connects the port and the network.
- The *control system* recognizes calling subscriber needs and organizes the connections in the network as required.
- The *switching network* provides a path that enables connections to be made between ports.

In considering major switching technologies, we must treat separately the technologies found in the major blocks of Figure 10.

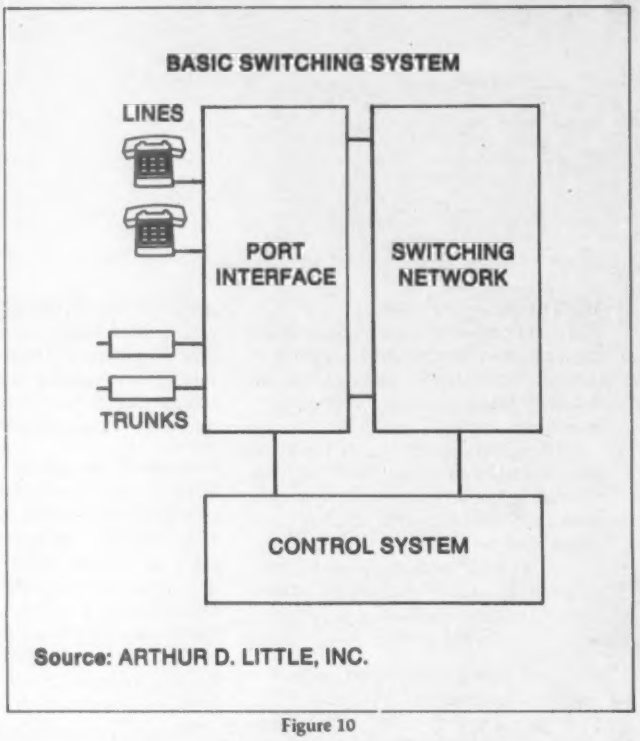

Figure 10

Control System Hardware

Call processor computers used in SPC systems fall into two basic categories:

- Special-purpose computers developed by the switching system manufacturer (or a vendor) designed specifically for the telephony application.
- General-purpose minis and microprocessors available on the commercial market.

Most suppliers in the '60s and early '70s opted for specially developed stored-program systems. It was reasoned that the then-existing computers available were not optimized for the switching control application. The development of hardware and software proved to be extremely costly; processing systems designed for batch operations and time-sharing were not as efficient as systems designed to support the highly cyclical and repetitive nature of telephone call processing.

Some advantages still exist for special-purpose design. However, the advantages are diminishing with very low cost, increasingly powerful micros and minis coming on the market and the use of distributed processing. For example, where "regional" processors are used for line supervisory functions such as off-hook detection, answer supervision and dial pulse digit analysis, a microcomputer like the DEC LSI-11 has sufficient power to process the calls for up to about a 10,000-line office switching up to about 20,000 calls in the busy hour, at a cost of less than $1,000.

There is universal agreement that the most serious problem facing the designer of a new SPC switch is the design of software; the design of hardware is relatively simple and straightforward. Almost without exception, since the beginning of SPC, development time and cost for software has been seriously underestimated. Despite problems in developing software, the SPC approach is clearly going to dominate future electronic switching systems design, because low-cost commercial computer subsystems and components can be employed.

Economies of scale in production of commercial minicomputers or microprocessors permit the switching manufacturer to reduce hardware development and manufacturing costs, compared with the relatively low volume manufacture of wired logic control units. With flexible software, switching systems can be adapted to different needs without the major hardware revisions associated with wired logic. The SPC approach allows a manufacturer to correct design faults and improve the efficiency of a switch as its life goes on and to adapt it to new service requirements as they arise.

In the design of stored program systems, two basic approaches have been used:

- Assembly language programming is performed, making use of symbolic statements for subroutines executed by the hardware logic in the machine. Programs are written in assembly language and converted into the object code of the machine (actual binary numbers) using an assembler.
- High-level languages are composed of symbolic statements which call for the execution of combinations of assembly language instructions having frequent or common use. Programming is accomplished writing in the high-level language statements which are converted into assembly language statements using a compiler. These are in turn converted into machine language (object code) via an assembler.

Assembly language can run significantly faster and make less use of the computer. To improve both the convenience of programming and efficiency in terms of memory requirements and CPU utilization, high-level languages have been developed for specific applications. The most famous are Cobol and Fortran developed for business uses. Increases in numbers of instructions vary from at best about 10% to at worst more than 100% compared with assembly language coding by skilled software people. Early computer-based telecommunications systems (SPC circuit switches, message and data switching systems) employed assembly languages, but for most DP applications, high-level languages are used almost exclusively since software development is substantially cheaper.

Today, there is a greatly improved understanding of the computer/communications art. It has become more a science and has lost some of its mystique and reliance upon a relatively few software assembly languages and compilers for telecommunications applications. Both specially designed and commercially available computers with powerful communications-oriented instruction sets are available. Techniques such as microcoding are used to extend the assembly language instruction repertoire to accommodate specific telecommunications functions in firmware.

High-level language inefficiencies in processor utilization and memory requirements on the order of 10% to 20% can readily be overcome by ease in programming the initial development, maintaining operating software and implementing changes. Modular, structured programming techniques are now used to contain malfunctions to subroutines by preventing errors from migrating into other modules.

No clear-cut advantage has emerged for any combinations of space-time and time-space switching. Multistage time-division switches would be least expensive; however, speed performance limitations make extremely large (larger than about 2,400 ports at present) all-time switches unrealizable and different manufacturers have chosen different approaches, presumably picking the one they regard as most cost effective. All-time switches will become more common in larger sizes in the 1980s.

Pulse-code modulation seems to have been agreed on as the internal language for digital systems; however, some proponents advocate other systems such as adaptive delta modulation, which offer advantages of less expensive coders, simpler filters and higher line capacity for a given transmission rate. Pulse-code modulation has the advantage that it is firmly established in the trunk telephone plant. It is likely, as converter prices are reduced, that the difference between pulse-code modulation and adaptive delta modulation will become smaller and that the former's position will remain secure.

Port Interface

The port interface must provide analog terminations for lines and trunks and digital terminations for multiplexed groups. The set of functions has been designated "Borsht" (battery feed, overvoltage protection, ringing the telephone, supervision, hybrid and test access). Except for the hybrid, similar Borsht functions are required for analog switching. The digital switch must also provide filtering and digital conversion functions. The choice of the number of channels that share one digital converter (codec) varies from manufacturer to manufacturer.

A digital termination provides the interface between the digital switch and a multiplexed group of digital channels. While the term is somewhat more contrived and less widely used, these functions have been dubbed "Gazpacho" (generation of outgoing frame code, alignment of incoming and switch frames, zero string suppression, polar conversion from bipolar to unipolar, alarm processing, clock recovery, hunting during reframe and office signaling extraction and insertion). Digital terminations must perform additional functions if the switch multiplexing and voice encoding techniques differ from those used in the transmission facility.

Most manufacturers still use conven-

tional technology (using transformers and relays) for the port interface. Integrated circuits are just finding their way into this part of switches, but will become pervasive as costs continue downward for high-voltage circuits.

Voice-Data PABXs

A digital PABX such as an SL-1 or GTD-120 switches digital pulse streams. It is only incidental that the streams represent voice signals. Two evolutionary trends present themselves:

- Interfacing with a digital pulse stream to central offices or other PABXs (the Gazpacho function).
- Combining data with voice switching. This brings PABXs into the general area of data controllers and will probably be the future general course for PABXs.

Two domestic PABX manufacturers, Northern Telecom Systems Corp. and Rolm Corp., already offer microprocessor-based add-on data transmission capability.

High-Speed Transmission

Transmission is an important area for development in future digital communications systems. Long-term trends are influenced by two different generic approaches:

- **Integrated Services Digital Networks (ISDN).** This is a concept for a universal network employing digital transmission, switching and terminal apparatus to serve all user needs for voice and nonvoice communications. Planning is under way in many advanced countries to develop the ISDN as the future evolution of the telephone network.

The requirements imposed on ISDN design are very stringent and, in the view of many, quite restrictive and costly, since it is difficult to conceive of a single optimally cost-effective system to handle the diverse assortment of new services that will be required. The most critical path in such a network is the local loop, which will continue to be based on wire pairs for many years.

- **Integrated Digital Networks (IDN).** Rather than a single network for all services, the IDN is an application-specific digital network which is separate from other networks, although it may share some facilities with other networks. AT&T's Advanced Communications Service is an IDN of this type, while the Satellite Business Systems (SBS) proposal is an IDN that will (according to present implementation plans) be completely independent of other networks.

The main advantage of an IDN over an ISDN is that it may be optimized for its intended service or group of services. A disadvantage is that economies of scale cannot be realized by sharing network resources among all services.

Digital systems planned in the U.S., Europe, Japan and various advanced countries for implementation over the next decade are all of the IDN type, although some are intended to handle multiple services such as voice, data and graphics.

In the U.S., the major obstacle to creation of IDNs independent of the public telephone network is the local distribution network.

The limitations of the telephone loop plant present opportunities for bypassing this component of the transmission network with higher capacity systems. Increasing requirements for high transmission rates may be expected over the next 20 years, during which time little improvement in telephone loop performance may be expected. A number of potential technologies are available today, or will become available during this period. Two general approaches are possible: 1) wideband local distribution, interconnecting with terrestrial or satellite long-haul circuits; and 2) direct satellite transmission, which eliminates the need for local distribution.

Several approaches may be considered for local distribution, based on the current state of the art and expected developments in cable, microwave, optical fiber and other technologies. Of these, we believe microwave and optical fiber technologies are the most promising. Other technologies may offer attractive alternatives in special applications.

The concept of microwave radio local distribution dates back (at least) to the late 1960s, when MCI Communications Corp. and Data Transmission

(Continued on In Depth/14)

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- IBM H series forecast – 1980 through 1984.
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- Software trends in the 1980s.
- The Japanese view on '80s technology and the U.S. market.
- Application, development and productivity requirements for the '80s.
- Competitor view on large scale systems for the '80s: Amdahl, Honeywell, and Univac.
- Prospects for the evolution of large scale systems in the 80s, IBM.
- Communications networks and services for the '80s.
- Industry outlook, "The EDP Demand Bubble": The Wall Street View.
- Strategic planning for Distributed Processing in the '80s.
- User views on challenges and opportunities for information systems of the '80s: Exxon, GE, General Host, Hughes Aircraft, among others, including some initial experiences with IBM's 4300 by three major users.
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R-4 HOW TO GROW YOUR OWN TELECOM PROS
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Gerald Goldstone, Editor/Business Communications Review

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IN DEPTH

(Continued from In Depth/11)
Corp. proposed microwave techniques to interconnect subscribers to their intercity microwave networks. Both fledgling firms encouraged suppliers to develop cheap short-haul systems for use in the 11-, 18- and 39-GHz bands. Nothing ever came of either company's efforts, however, because technology was not yet sufficiently advanced and neither company could muster the capital necessary.

Today's technology is more amenable to realizing microwave local loops. Xerox's Xten proposal for the 10.55-GHz band would seem to offer good prospects to overcome the high cost of digital radios. Present microwave radios use either phase-shift-keyed (PSK) modulation or a combination of PSK and AM, called quadriphase partial response filtering (QPRS). Both approaches allow quite high bandwidth efficiency (2- to 4 bit/sec per Hertz) but are costly to implement, because of the need for precise timing circuits in the receivers. Xten proposes to use frequency shift keying (FSK), an inherently less expensive design, but less efficient (Xten proposes .8- to .9 bit/sec per Hertz). Therefore, Xten has chosen a compromise between price and performance.

The critical technology in PSK-modulated microwave radios is in timing circuits necessary for clock recovery and regeneration. As LSI costs go down and the availability of suitable standard circuits increases the cost disadvantage of the PSK approach may lessen. We foresee a reduction in digital microwave transmitter-receiver prices by the mid-1980s to the cost of analog radios today.

Optical local loops on a practical scale are probably at least 20 years away in the telephone network. The cost to rewire a substantial portion of the national system with optical fibers is immense. However, the selective installation of optical fiber cables to serve a very limited population of business users is a much smaller scale problem. Optical fibers offer large bandwidth and no spectrum congestion problems and promise to be quite inexpensive.

Rapid progress is being made in low-loss (less than 1dB per kilometer) long wavelength fibers and inexpensive solid-state laser sources that should permit installation of systems having capacity of greater than 100M bit/sec by the mid-1980s. The NTT Laboratories (Japan) recently reported experimental results on unrepeatered fiber optic spans of 50- to 60 kilometers, at transmission rates of 32M bit/sec to 100M bit/sec using 1.3 micron wavelength single-mode fibers and InGaAsP laser diode sources.

We estimate the cost of such systems in 1985 will be approximately as follows, not including installation:

An electro-optic terminal including transmitter, receiver and modulator will cost $1,600, and a long-wavelength, single-mode fiber cable will cost 25 cents per fiber-meter.

Therefore, for a typical local loop system, using a single fiber pair, with 4-kilometer path length, the cost would be $3,200 for two terminals and $2,000 for the cable — a total of $5,200.

The above does not include installation costs, which could greatly exceed the equipment and materials cost, unless existing ducts could be utilized. Ducts may be available in many cities, however, such as those housing electrical power cables. Where ducts are available, the total installed cost of the exemplary 4-kilometer local loop may be less than $10,000.

If one can locate a satellite earth station on a rooftop (or in an adjacent

(Continued on In Depth/16)

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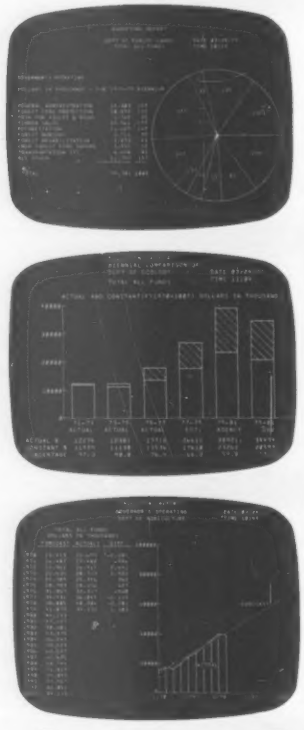

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IN DEPTH

(Continued from In Depth/14)

field, for example), then one can access a long-distance satellite transmission system directly, without the need for a separate local distribution system.

The cost of an earth station depends on the types, volumes and quantities of communications it must handle, along with the performance parameters of the satellite with which it is used. One must therefore trade off satellite costs against earth station costs for a given set of communications requirements, and the optimum tradeoff will depend on the particular system.

A major factor determining earth station cost is the method of access used. The simplest (and least expensive) is frequency division multiple access (FDMA); that is, the earth station accesses the satellite via a preassigned channel. This mode is currently used in all U.S. domestic satellite systems. It is very cost-effective in systems where a relatively few earth stations communicate with each other and each carry large volumes of point-to-point traffic. However, where a large number of relatively small users must access the satellite, the capacity of the transponder must be drastically reduced to prevent harmful intermodulation distortion resulting from nonlinearities of the transmitter traveling wave tube.

Time-division multiple-access (TDMA) techniques now planned for domestic satellite applications are ideally suited for increasing RF channel capacities in satellite systems that must be accessible to many users. Using pulse-code modulation TDMA, the transponder deals with only one signal at a time, thereby minimizing the effects of nonlinearities and increasing the capacity of the transponder. One earth station is capable of receiving signals from many other TDMA stations over a single channel, resulting in more economical use of equipment. In TDMA, digital modulation techniques are employed, filling the entire transponder bandwidth.

Critical to the operation of TDMA systems are the techniques used for timing the individual message bursts from the accessing earth stations to ensure they do not overlap in time at the satellite receiver. Each burst consists of a preamble word and an information burst. The preamble contains bits for carrier phase and bit timing recovery, as well as station identification, signaling and so forth. Because the information is transmitted in bursts, the bit stream must be restored to its normal clock rate.

The so-called burst modem in a TDMA system is of critical importance and is quite costly at present. TDMA subsystems suitable for use at transmission rates of tens of megabits currently add about $200,000 to $500,000 to the cost of an earth station. While we see no apparent breakthrough in the near future that will drastically reduce this cost, gradual reduction may be expected from semiconductor cost/performance improvements and from volume production. The SBS earth stations will use a proprietary form of TDMA, and American Satellite Corp. is planning to upgrade its network stations with TDMA. Western Union's new TDRSS satellite will interface with TDMA-equipped earth stations, as well.

As the data rate is reduced, the precision required of timing and synchronization decreases. Various approaches have been proposed to allow many thousands of earth stations to access a single voice channel at data rates of less than 100 bit/sec, using very inexpensive TDMA. One approach broadcasts timing information via terrestrial radio stations to synchronize thousands of small, low data rate earth stations. The cost of each earth station is estimated to be less than $30,000, but its use would be limited to low-speed messages.

This review of the overlapping areas

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TECHNOLOGICAL UNDERPINNINGS

IN DEPTH

of telecommunications and information processing technologies was intended to place in perspective the present trends that are drawing the two industries together. Telephone system technology, almost from its earliest days, has embodied the concepts of storage, control and digital signaling that form the basis of machine computation. Both telecommunications and information processing system designs are based on modern information theory principles, and both owe to semiconductor technology considerable credit for the marked improvements in cost/performance that have been realized in recent years.

Arthur H. Solomon is deputy manager of the Telecommunications Sciences Section, Arthur D. Little, Inc., Cambridge, Mass.

Solomon's professional interest focuses on business strategy and systems engineering. His recent work has encompassed microwave; satellite earth stations; PABX and private network switching systems; domestic carriers; telecommunications equipment and services; electronic mail; and voice and data systems.

Solomon holds a BSEE degree from MIT and has done graduate work in electrophysics at the Polytechnic Institute of Brooklyn.

Both technologies have become, to a great extent, application areas for stored-program control computers.

While the information processing industry is generally associated with the design and production of computers and the development of the software programs to run them, it is perhaps more accurate to represent today's telecommunications/information processing industry broadly in terms of three types of participants:

- Those who make computers and programs for specialized telecommunications applications (such as telecommunications equipment manufacturers).
- Those who make computers and programs for other specialized and general applications, some of which may be used in telecommunications systems (such as electronic data processing equipment manufacturers).
- Those who make the semiconductor devices, including microprocessors, which are the building blocks for the first two.

We therefore have today two types of computer makers, both supported by the semiconductor makers. With respect to the former, it is more their respective market applications that distinguish them than their technologies. With a little acquired help, a technologically skilled participant in either market area may choose to try his luck in the other. A number have already done so, and many more undoubtedly will.

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Without a DP Staff

Tank Maker Slashes Inventory Updating

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BIRMINGHAM, Ala. — A user-oriented, on-line minicomputer system has enabled a moderate-sized manufacturing company here to slash its inventory update rate from one day to 15 minutes, reportedly doubling the number of customer orders it ships on time.

Read Steel Products, which manufactures agricultural storage tanks and bulk bins, sought the fruits of a system that would provide flexibility and responsiveness without turning to an outside service bureau or adding an in-house DP department. By acquiring a Hewlett-Packard Co. HP 3000 minicomputer system with Image/Query data base management software, the family-owned company not only accelerated its administrative functions, but was granted the independence it needed, according to Ed McCauley, director of material control at Read.

Resembling oversized tin cans, these storage tanks were assembled from parts shipped via a computer system that tracked each nut and bot and, in some cases, even remembered to include a screwdriver with the shipment.

"Our company philosophy says if you want to get something done, do as much of it as possible yourself, and make sure you know enough about the rest to get the proper help," McCauley said. "None of us at Read are programmers, but I knew that . . . if we had to, we could become independent after creation of the initial [system] software."

Read's software includes a package called Orein for order entry, inventory control and production. Developed by GTS Computer Systems, Inc., the software is built around

(Continued on Page 59)

Rexon Makes Enhancements To RX30 Multiterminal Systems

CULVER CITY, Calif. — Rexon Business Machines Corp. has announced a number of enhancements for its RX30 Marathon multiterminal computer system that range from a self-test firmware program that checks for system failures to a battery backup unit that protects the computer's data in case of power outages.

Most of the enhancements are supplied at no cost to the user since the computer, introduced in mid-1979, was designed to incorporate these features as they became available. The Marathon system is geared to the needs of small to medium-sized businesses.

The first enhancement, the self-test firmware, is activated each time the machine's power is turned on and the reset button is depressed. Resident on a plug-in board, the program performs a functional test of the major system components in order to ensure the proper operations of random-access memory, serial I/O channels, cartridge disk controller, cartridge disk drive and system interrupts.

If any of these components fail to respond positively, the tests are terminated and a group of LED lights inside the computer's cabinet indicate the faulty subsystem, pointing the way to the defective board or peripheral, a spokesman explained.

The firm also added signature analysis test points for on-site diagnosis and has incorporated the ability to load and execute diagnostic tests remotely over a serial channel line.

Battery Backup

The next enhancement is a battery backup device that automatically provides power to the system's memory and necessary support components within a fraction of a second of a power failure, the spokesman claimed. The contents of the memory are maintained for up to eight hours, and system operations resume exactly where they left off when regular power is restored.

(Continued on Page 58)

Printer Gives 1.25 Line/Sec

RIVERTON, Wyo. — LRC, an Eaton company, has unveiled a dot matrix printer for home and small business computer systems that features unidirectional printing with a line speed of 1.25 line/sec.

The Model 7000+ printer accepts single- or multi-ply paper rolls and has a capacity to print 40 columns at 12 char./in. The unit's print head has a minimum life of 100M characters, while the overall mechanism life of the device is 10 million cycles, a spokesman claimed.

The 7000+ comes with a variety of interfaces, including Radio Shack's TRS-80 parallel, Apple Computer, Inc.'s parallel, RS-232C, Commodore Business Machines, Inc.'s Pet IEEE and current-loop.

The printer accepts the full Ascii character set, upper and lower case, and can print in both single- or double-wide fonts. Options available include a 120-char. buffer.

The 7000+ costs $389 from the company at 225 S. Euclid Ave., Pasadena, Calif. 91101.

Like the Lear Siegler ADM-31, a highly intelligent buffered terminal that practically thinks for itself. And the smarter ADM-42 with its 15-inch diagonal screen. Or the low-cost DUMB* terminal from LSI, the ADM-3A which at $850 makes a lot more sense than its name implies.

DASI is the nation's largest independent supplier of telecommunications equipment and can provide a full range of printers, CRT terminals and computer peripherals from stock through a coast-to-coast network of sales and service facilities.

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Package Backs Personnel Work

LOS ANGELES — Xxcal, Inc., an authorized microsystems dealer for Pertec Computer Corp. (PCC), has introduced a small business computer tailored for personnel agencies and corporate employment offices.

Offered as a complete hardware and software package, the Human Resource Management System includes PCC's Model 2000 microcomputer and 1.2K bytes of diskette storage that can reportedly hold up to 100 search requests and about 2,000 resumes. A Centronics Data Computer Corp. 710 printer is also a part of the personnel computer.

For users who already have a minicomputer or microcomputer system, the software can be purchased separately and adapted to fit most hardware configurations.

Xxcal will adapt the software to user hardware for an extra fee, based upon the type and configuration of the equipment, he added.

The total system, including hardware and software, costs $15,950, while just the software is priced at $2,500.

Xxcal is located at 11704 Wilshire Blvd., Los Angeles, Calif. 90025.

Rexon Adds Enhancements To Marathon Systems

(Continued from Page 57)

The firm also beefed up its device adapter package for the Marathon by increasing from two to four the number of printers that may be added to the computer.

Users can also add four CRT terminals and two printers to the computer, whereas previously only the four terminals or the printers could be added through the adapter package, the spokesman stated. The package costs $4,600.

Finally, Rexon announced several software product enhancements for its RX30 including a direct file access method.

More information on the RX30 and its recent enhancements can be obtained from Rexon at 5800 Uplander Way, Culver City, Calif. 90230.

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Intelligent Single-Board Controller Interfaces VAX, PDP-11 Minis

SUNNYVALE, Calif. — Microcomputer Systems Corp. (MSC) recently introduced an intelligent, single-board controller that is said to allow Digital Equipment Corp. PDP-11 and VAX minicomputer users to interface their machines with Winchester and other high-capacity disk drives.

Designed to accommodate DEC's Unibus structure, the MSC-1101 plugs directly into a single backplane slot and is compatible with drives having a storage module interface, including removable drives with capacities up to 600M bytes per spindle.

Standard features of the controller are command chaining, automatic error-correction and retry recovery, implied overlapped seek, automatic head and cylinder switching and direct memory access (DMA) load regulation, a spokesman noted.

Although the 1101 evolved from the firm's MSC-1000 controller series, the new board differs from the old in that existing DEC software drivers are not compatible with the board's command protocol, needed to achieve the performance increases, the spokesman continued.

Therefore, MSC provides users with software integration packages that allow DEC's RT-11, RSX, IAS, RSTS/E and VAX/VMS operating systems to function with the addition.

Communication with the controller is accomplished via control blocks assembled in main storage and Unibus registers assigned to the controller, he explained. Command address and primary control and status information are stored in the registers, and command information is passed in the control blocks.

Because the MSC-1101 is microprocessor-based, much of the I/O processing normally performed by the CPU is reportedly eliminated. Once control is passed to the board, I/O operations proceed to completion by DMA without further software intervention, the spokesman claimed.

Finally, since the controller utilizes large-scale integration circuitry, fewer components and connections are used in its construction, limiting the possibility of maintenance problems, he added.

The board costs $4,850 with quantity discounts available from the company at 432 Lakeside Drive., Sunnyvale, Calif. 94086.

Entry-Level Mini Package Features Add-On Modules

SAN LUIS OBISPO, Calif. — Williams & Associates is offering an entry-level minicomputer system for manufacturing planning that can be customized to different applications through add-on modules and can handle up to 32 CRT terminals.

Basically a turnkey package, the system has 64K bytes of memory and 10M bytes of disk storage. The computer also includes one CRT terminal and a serial printer with a speed of 180 char./sec.

On the software side, the system is fully journalized to facilitate interfacing to a company's accounting system and has management and inventory programs. Other software includes a work-in-progress monitor and job tracking routines, job cost programs, shop load and shop floor control programs and a bill of material processor.

The system is priced at $30,000 or can be leased on a five-year contract for $750/mo. Williams & Associates is at 626 Al-Hi Drive, San Luis Obispo, Calif. 93401.

On-Line Mini-Based System Cuts Inventory Update Rate

Continued from Page 57)

the firm's HP 3000 Series I mainframe with 128K bytes of memory. But McCauley pointed out that he could upgrade to a Series II or even a Series III without additional software costs.

In addition to the mainframe, Read's hardware consists of an HP 7920 50M-byte disk drive, an HP 7970E 1.6K bit/in. tape drive, a 300 line/min printer and five CRT terminals. The system can accommodate a total of 16 terminals, and Read is considering eventually linking up to its scattered warehouses via modem. In time, routine business operations, such as payroll, may also be handled by the system.

Order Entry

Customer orders are received directly by phone and mail through the company's sales staff and warehouses, McCauley noted. Recorded first on form, the orders are transferred to the computer over the CRTs.

The order entry program guides the operators through a series of questions, making it unnecessary to have any vast DP knowledge, while a second program prints out a hard copy of those orders just entered.

Since its products are assembled in the field, Read requires a highly accurate system to assure that all necessary parts are included in the shipment.

This is particulaurly true because a percentage of Read's sales are export, and many of its overseas customers are located in remote areas where a missing part could mean a lengthy delay.

It used to take Read three days to generate pullsheets listing all of the components for weekly shipments. Now the computer achieves this in one hour and the results are more accurate.

All the parts, subassemblies and assemblies for a product are stored in memory for immediate retrieval when the order number is keyed in.

Inventory Control

Similarly, it formerly took a day to post the previous day's shipments to inventory, McCauley continued. Manually exploding a bill of materials required breaking out assemblies and subassemblies as well as parts purchased.

Not only was this a lengthy procedure, but it was also virtually "proprietary." That is, most of the know-how for the job was confined to one employee. When this employee was out, the entire inventory control process was delayed.

Read has two computer programs to handle and track materials — Shipping Update (Shipupd) and Product — that automatically explode the bill of materials and monitor parts shipped and received in real-time.

Material requirements planning is implemented by Grosneed, a program designed to forecast production needs over a specified period, McCauley explained.

But even though the computer technology has increased Read's shipping rates and decreased customer wait times, it is the machine's ease of use and the firm's resulting independence that most impresses McCauley.

"Our computer does what we want it to and we haven't had to yield control to a data processing staff," he said.

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Drafting System Hikes Switch Design Accuracy

By David Christensen
And Carolyn Barlow
Special to CW

CRYSTAL LAKE, Ill. — Greater design and construction precision plus the ability to produce detailed engineering drawings of electronic circuitry are two advantages of a computer-based drafting system developed and used by a switch manufacturer here.

Driven by a Digital Equipment Corp. PDP-11 minicomputer, Oak Technology, Inc.'s drafting system calculates the exact coordinates of machine components and creates a punched tape that can be used for numerically controlling a machine that makes switching parts. The switches — used in electronic devices, especially computers — are actually flat, layered panels containing a printed ciruit board, wired interconnections and other control membranes.

The 48K-byte system has multiple operator consoles that share the mainframe and all other peripherals. Each console consists of a standard data entry keyboard, an auxiliary keyboard with 64 user-definable keys and an electronic pen and tablet for making changes directly on the system's CRT. Symbols drawn with the pen are user-programmed for speeding drawing modifications. Merely tracing around a switch or component will immediately magnify that small area to fill the entire screen.

The drafting system has a tablet input, based on a grid system, with a resolution of 32,000 by 32,000 points (top to bottom and side to side). This feature, plus the capability of magnifying extremely small areas to fill the CRT screen, means that a one-nanometer line can be displayed with a length resolution of one part in 32,000.

Shared Components

The other units shared by the consoles are the mainframe itself — complete with integral diagnostic and debugging facilities; a number of plotters used for hard copy and producing electronic photo masks; an 87-million-word disk memory of 11 stacked "hard" (also removable) disks; and a reel-to-reel magnetic tape system for archival storage of completed switch designs.

In the Oak computer system, 16 different membrane or control levels are described and designed via special programming. From the uppermost level, the designer starts by "drawing" on the CRT screen each layer's outline and the locations for the various graphics and labels for each switch on the upper membrane surface.

Next, a view of the metal backing on the membrane is selected. When switch locations are specified (by x and y coordinates), the sizes, shapes and exact locations of these metal "shorting bars" are automatically produced in the view as soon as the switch type is selected from a "switch menu" already in memory.

'Step and Repeat'

When all the switches in the overall panel are of the same type, a simple "step-and-repeat" command to the computer automatically draws in each switch at the x and y coordinates specified by the designer. Legends are entered on each CRT drawing to specify types of materials to be used for both the membrane and the metal backing, as well as exact thickness.

Views of the insulating separator layer are displayed next, and the computer automatically shows the sizes, shapes and locations of each hole that must be precisely registered underneath the metal-backed areas on the upper membrane. Separator thickness and material type are also entered in memory and displayed in the CRT drawing.

Upper and lower surfaces of the circuit board, including the exact locations of all necessary contact "fingers" and electrical connections, are viewed in the same way.

Switch positions and design modifications can also be altered without having to call up each particular circuit layer. The computer automatically changes each membrane to correspond to a designer's modification.

Christensen is director of product development and Barlow is manager of computer design at Oak Technology, Inc. in Crystal Lake, Ill.

"When word gets out that I'm from Informatics, my co-workers start coming to me for answers."

Jean Bodnarchuk
Programmer/Analyst
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"Even though the company I'm working with has pretty sophisticated systems, my Mark IV experience makes me the person everyone comes to first. I'm the only Informatics person in the group. I get a lot of respect for that connection because when Informatics sends you out on a project, you really know what you're doing.

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Little Long-Term Impact Expected

Carter Freezes DP Exports to Soviets

By Marcia Blumenthal
CW Staff

WASHINGTON, D.C. — President Carter's recent decision to indefinitely suspend validated export licenses for shipping high-technology products to the Soviet Union will put a crick in the activities of some U.S. computer firms, but the long-term impact of the Administration's action is expected to be minimal.

On Jan. 8, Carter directed Secretary of Commerce Philip Klutznick to "review" the policy for high-technology exports to the Soviet Union in light of the USSR's recent invasion of Afghanistan.

The next day Carter ordered Klutznick to suspend all outstanding validated export licenses. A total of 812 licenses are affected by the order, a Commerce Department spokeswoman said, adding that it was unknown how many of the licenses were for computer products.

Minimal Sales

Univac has $5.4 million in orders awaiting either shipment to the Soviet Union or license approvals. Putting Soviet sales in perspective, however, Univac said these sales totaled about .1% of total corporate sales, which last year were $4.2 billion.

Control Data Corp. reportedly has sold $50 million in computer products to the Soviet Union during the past 10 years. These sales totaled less than 1% of CDC's computer revenues of $1.8 billion last year, a spokesman said.

The firm also has a technology transfer program called Technotec in which the Soviet Union participates [CW, Nov. 27, 1978]. CDC is awaiting word from the Department of Commerce on limitations to this program.

However, CDC plans to go ahead with its sponsorship of an art exhibit of masterpieces from the USSR's Hermitage museum.

Like Univac and CDC, IBM said its business with the Soviets is minimal. "In 1978, for example, we exported only $18 million worth of computers, and in 1979 it was even less than that," according to an IBM spokesman.

Representing the industry, the Computer and Business Equipment Manufacturers As-

(Continued on Page 62)

Four-Phase Stock Drops in Price

CUPERTINO, Calif. — A company announcement projecting a moderation in revenues and earnings growth for 1980 caused the price of Four-Phase Systems, Inc.'s common stock to drop more than $12 in one week earlier this month.

Four-Phase made the projection in conjunction with an announcement of anticipated 1979 financial results which will be available at the end of the month.

While the company expects record revenues and earnings for 1979, it also said a possible recession and increased development costs probably would give rise to a short-term decline in net income. The firm also expects a moderation in revenue growth for 1980, according to Lawrence Roberts, assistant treasurer and director of investor relations.

Despite this year's economic outlook, Four-Phase intends to increase its development and engineering expenditures by 50%, Roberts said.

Roberts attributed the decline in the price of the company's stock entirely to the firm's public statement of projected 1980 results. The day the announcement was made, the stock was trading at $46.38; a week later it closed at $34.25.

The sharp decline probably occurred because the firm never before projected a decline in growth rates, Roberts theorized. On the average, Four-Phase increased revenues by 39% and earnings by 111% during the past four years.

For 1979, Four-Phase anticipates revenues will top $175 million, up 29% from 1978 revenues of $136 million. Earnings are expected to climb 26% to $3.25 per share, up from $2.58 per share earned in 1978.

Zilog Small Business System Targets 'New Breed' of OEMs

By Jeffry Beeler
CW West Coast Bureau

CUPERTINO, Calif. — As the small business systems field has begun to mature, so have many of its original equipment manufacturers.

The emergence of this new breed of OEMs has opened a vast, unexplored business opportunity for vendors with the expertise to capitalize on it, and one of the companies intent on shaking that promising new market is Zilog, Inc., according to William Hesley, marketing manager for Zilog's Microcomputer Systems Division here.

Only a few years ago, many small business OEMs seemed more interested in configuring their systems with the latest technological gadgetry than with providing cost-effective solutions to their customers' problems. Today, the marketing emphasis among small business OEMs has reversed itself dramatically, Hesley said. Compared with their counterparts of yesteryear, the new-breed OEMs are much more demanding in their system expectations and are more discriminating about what "bells and whistles" they incorporate in their configurations. They regard their main mission as providing custom-built systems for the lowest possible price.

Expanded Scope

Founded in 1974, Zilog first made its mark on the computer industry as a supplier of high-technology components, particularly the Z-80 microprocessor. Since then the company has expanded the scope of its operations to include microcomputers. Now with the introduction of its MCZ small business computer series, the firm has established itself for the first time as a manufacturer of very small systems in the less-than-$10,000 price range.

Zilog announced its four MCZ microcomputer systems late last year and will sell the products primarily to the new-breed type of commercial OEMs and to sophisticated end users. The OEMs will use the systems mainly as tools for building custom-designed microcomputer configurations, which in turn will be sold to users as solutions to business problems, according to Rolando Esteverena, general manager of Zilog's Systems Division.

For the moment, Esteverena and his col-

(Continued on Page 66)

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ECS Lands $15 Million Contract

SAN JOSE, Calif. – ECS Microsystems, Inc., an Australian company that recently transplanted its headquarters from "down under" to Silicon Valley, has come out on top with a $15 million contract for its ECS 4500 multiprotocol terminal.

The ECS 4500 was introduced in New York earlier this month (see story on Page 39).

The company, which established its international headquarters here in October [CW, Dec. 10], will continue to maintain its operations in Australia, but even so, that country's government was loath to see ECS move. A lot of red tape was involved before the move could be completed, according to an ECS spokesman.

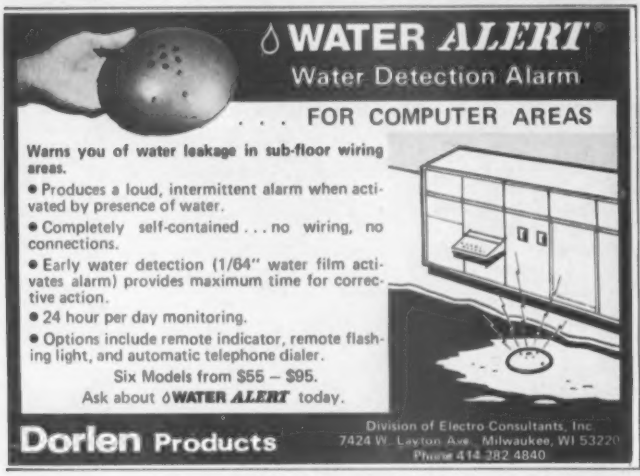
ECS' new contract provides for an exclusive European distributorship with Telecomputing International, Ltd. of Oxford, England, and Amsterdam, Holland. Deliveries of the ECS 4500 Series and related products will be made over a two-year period.

The 4500 provides microcomputer-based integrated hardware and software capabilities, plugging into and emulating large mainframes from IBM, Burroughs Corp. and Honeywell, Inc.

Under the agreement, Telecomputing has exclusive representation in 27 European countries and plans to open offices in Germany, Belgium and Ireland during 1980. Countries presently under the agreement include Finland, Sweden, Norway, Denmark, West Germany, Netherlands, Luxembourg, France, United Kingdom, Ireland, Spain, Portugal, Italy, Austria, Switzerland, Greece, Turkey and Malta.

Although ECS stressed it is not abandoning its Australian operations, the company's move to Silicon Valley indicates its full-scale commitment to the U.S. end-user market.

ECS plans to open six offices in 1980, beginning in California and moving across the country by region, providing service support in each region before expanding to the next area.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Carter Suspends Exports to Soviets

(Continued from Page 61)

sociation (Cbema) endorsed Carter's imposition of a moratorium on computer exports. "We hope the President can soon obtain assurances from our allies that they will take a similar firm stand on denying Soviets access to these strategic goods," Cbema President Vico E. Henriques said.

"Cbema members do not hold exclusive domain over the availability of high technology. There are multiple sources and, without unanimity among our allies, these measures would prove ineffective," he cautioned.

Commerce Figures

Statistics furnished by the Department of Commerce show that for the first nine months of 1979, computer trade with the Soviets totaled $18.8 million.

In 1978, total computer trade with Russia was $17.6 million. The discrepancy between IBM's claim of $18 million in exports in 1978 and Commerce's figures of $17.6 million total computer trade with the Soviets was unresolvable at press time.

Projecting $25 million in sales for 1979, the Commerce Department said computer products make up only 3.1% of total U.S. trade with the Soviets, which is forecast to hit $3.7 billion this year, $2.9 billion of which is agricultural products.

In 1978, the U.S. sold $2.2 billion to the USSR, $1.7 billion of which was agricultural goods.

DP Products

Although the largest gain in trade with the Soviets has been agriculture, sales of computer products grew 42% from 1978 to 1979.

Of the computer products sold, mainframes sold in 1979 accounted for $11.7 million, whereas in 1978 total mainframe sales were $8.1 million. Likewise, parts of DP equipment totaled $2.7 million in the first nine months of 1979 compared with $1.7 million for 1978.

Disk drives for the same period totaled $628,900, compared with 1978 disk drive sales of $696,000.

Entwined With Politics

While the impact of the ban on the computer industry is expected to be minimal, Carter's latest prohibition seems to be another example of how entwined the industry is with international politics.

The Administration recently approved a long-delayed export license for Univac to sell an 1100 system to the Soviet news agency Tass [CW, April 16, 1979]. The delay in approving this system was a U.S. reaction to the sentencing of Soviet computer scientist Anatole Sharansky to 13 years in prison.

While the action prompted sympathy from groups of computer professionals, the sale, although finally approved, was ultimately lost to a consortium of French firms.

In October, in response to Secretary of Defense Harold Brown's recommendation to deny an export license for a Cyber 73 bound for the Soviet Ministry of Geology, CDC called the action "a political decision."

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Also Backs USPS in EMS

White House Staffer Sees Rewrite Bill in 1980

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Congress will enact a new communications act this year, Richard Neustadt, the assistant director of the White House Domestic Policy Staff, believes.

In a recent speech to the Federal Communications Bar Association here, Neustadt also said the Carter Administration wants the U.S. postal Service (USPS) to compete on an equal footing with commercial suppliers in the rapidly emerging electronic message services (EMS) market — an idea many suppliers vigorously oppose.

Neustadt is confident that a revision of the 1934 Communications Act "will be on the President's desk in 1980" because the House Communications Subcommittee's latest version of this legislation [CW, Dec. 24] has been endorsed by every member "and it looks quite good." Moreover, the Senate Commerce Committee has said it intends to pass companion legislation early this year.

In a subsequent interview with *Computerworld*, Neustadt added that the growing availability of competitive telecommunications services is generating pressure to get legislation passed.

To meet this new competition, he pointed out, AT&T will have to lower its rates for high-density circuits among major cities and raise rates for the services provided to lower-density areas. Rural telephone companies, the assistant director said, fear the effects of these changes on their revenues and need the pending legislation "to cushion the blow."

Views on EMS

Regarding EMS, Neustadt told the bar association that USPS "should be allowed to provide so-called 'Generation II' service," which consists of on-line transmission of messages from the user's site to the post office nearest the recipient, conversion of the text at the latter point to hard copy and delivery by mail carrier.

While the administration wants the postal monopoly restricted to carrier delivery and the associated message conversion function, Neustadt said, it also believes USPS should be free to lease communications circuits and develop a service equivalent to those offered by commercial firms.

"Some critics say that this service will lead inexorably to a postal takeover of telecommunications," he told the bar association. "Apart from the improbability that the postal service can beat AT&T, IBM and the others — in the marketplace or on the Hill — these critics misunderstand the proposal. Most of the postal service's investment will be in machines that produce paper. Electronic transmission will be done by [facilities leased from] private carriers."

Neustadt added that while "some technology buffs promise electronic mail for everyone . . . the truth is that we will be using paper for a good long time.

"We can expect terminals in many corporate offices soon, because business-to-business electronic message service is faster and cheaper than mail. That, of course, is the market firms like [Satellite Business Systems] and Xerox Corp. are chasing. But is covers only 5% to 10% of mail volume.

"It is true that the cost of electronics is falling and the cost of mail is rising — some day we *will* have universal electronic mail. But in the meantime the people want mail service, billions of pieces of paper must be moved and the postal service should use the most efficient technology to do this job."

Major Objections

During the interview with CW, Neustadt said commercial EMS suppliers object to competing with the Postal Service partly because they're afraid revenue earned from conventional mail operations will cross-subsidize the agency's EMS.

The Carter Administration, however, is convinced this can be avoided by requiring USPS to establish a fully separated EMS subsidiary and prohibiting the two organizations from sharing equipment, building, or personnel.

The other major industry objection, Neustadt said, is that USPS will be able to borrow money on more favorable terms than private companies and will be able to charge lower rates for EMS. Even if this happens, he contended, the Postal Service is burdened with "countervailing disadvantages" — such as high labor and fringe benefit costs.

Neustadt reported that White House officials are actively trying to resolve the current argument over the Postal Service's proposed electronic computer-originated mail system. The Postal Rate Commission, which must approve the service before it can be offered, has recommended that USPS provide only a conversion and delivery service at the receiving end of the message path (at least initially) and let commercial vendors provide the transmission. USPS, however, wants to offer a total Generation II service.

The Postal Service's board of governors, now considering the rate commission's recommendation, deferred action until its February meeting.

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CW/209

With Two-Week, Intensive Course

Latin Americans Trained in PCC Micro Sales

SANTIAGO, Chile — Latin American students enrolled in a Pertec Computer Corp. (PCC) training session here discovered recently that language is never a barrier as long as the language is DP.

Although the Pertec instructor spoke no Spanish and the 15 students enrolled in the class didn't speak English, communication was established through the languages of Basic and Cobol, according to Ed Towers, regional sales manager of PCC's Latin American Operations.

The two-week long, intensive, 9:30 a.m.-to-midnight training session taught the 15 software students — and another five hardware students who enrolled for the second week of training — how to program, service and sell Pertec's PCC 2000 desktop micro system.

Manuals were sent to the students the month before the session began to give them time to study and review. Three computers were available to students for hands-on training and machine time was portioned out to all of them. The training consisted of lectures, lab work and homework.

The course, which proved to be a success for both the students and PCC, is part of a company effort to broaden the availability of its micro systems in South and Central America, Towers noted.

Only the most qualified distributor in a country is selected to participate in a training session, Towers said. Marketing strength and business skills are primary requirements and DP knowledge is of secondary importance. Through the program, "we can teach appropriate members of a distributor's staff what they need to know . . . how to operate the hardware, make board-level repairs, develop solution-oriented applications software packages and acquaint them with selling features beyond the system," Towers said.

Latin American distributors, like many of their North American counterparts, realize that their customers are more concerned with solutions than with the intricacies of the computer itself. So, once the distributor is selected, the Pertec staff works with the sales personnel to develop marketing strategies appropriate to their country, the product, their staff and their customers, Towers noted.

Pertec has discovered that standard application packages available in the U.S. aren't necessarily workable in Latin America. "The different business practices — sometimes within an industry in a given country — don't lend themselves to the type of broadly constructed, parameterized software we have in the U.S.," Towers said. Therefore, Alice Johnson, systems analyst and course instructor, uses the class to teach software development methods to selected class members who have an aptitude for programming.

As a result of the software class, the Peruvian distributor prepared an applications package designed to provide a product location directory for attendees at the Peruvian Industrial Fair. As visitors entered the exhibit floor, several PCC 2000s helped attendees locate exhibits by type, manufacturer or country of origin. The attendees liked the idea, Towers claimed, adding that it saved them time and energy and allowed them to concentrate on the products in which they were interested.

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Computer Output Equipment is the topic of our February 25 *Computerworld* Special Report. Edited by Nancy French, the report will be examining the increasing variety of computer output equipment, with problem-solving tips by users, as well as advice from vendors on topics like:

- *Output selection: hacking through the equipment jungle*
- *Microfiche and microfilm: designing and planning a COM system*
- *High-Speed non-impact printers: when do they get cost-effective?*

If you want to keep abreast of this ever-changing market, don't miss our February 25th Special Report.

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Report to Cover Office Systems

MOUNTAIN VIEW, Calif. — A monthly newsletter called the *Office Computing Industry Report* is being introduced to cover that emerging industry by focusing on the convergence of small-scale DP, word processing and data communications systems.

The report will also cover the merging of DP and business machine distribution systems and support activities and the relationship of these systems to network-based information systems and distributed processing, according to its publisher, Vantage Research, Inc.

The newsletter will provide news analysis, market forecasts, new product reviews, vendor profiles, technology forecasts and insights into business opportunities.

The report is available from Vantage Research, the market research and consulting firm, at an annual subscription price of $195 in North Amercia and $225 in Western Europe and Asia. The firm is located at 2680 E. Bayshore Road, Mountain View, Calif. 94043.

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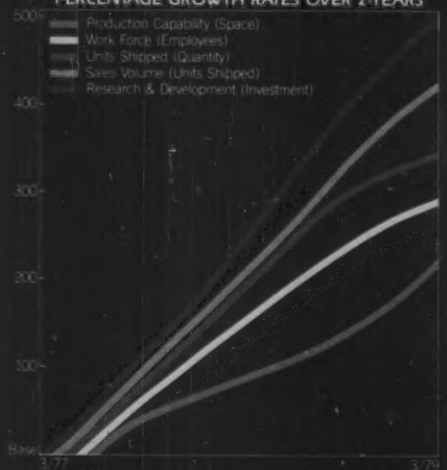

SPERRY UNIVAC
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'Computerworld' Parent to Sponsor China Trip

By Ann Dooley
CW Staff

FRAMINGHAM, Mass. — Opening the way to an expected multibillion-dollar computer market in the 1980s, CW Communications Inc. is sponsoring a series of trade missions in the People's Republic of China.

The *Computerworld* publisher was asked by the Chinese Institute of Electronics — a leading decision-maker in the computer arena in Chinese government — to host three such missions in 1980. The first mission, March 13-29, will focus on the "Planning and Development of Data Communications and Data Base Systems."

Although the purpose of the mission is to stress U.S. friendship and goodwill, it will also provide participating companies with the chance to facilitate future business contacts for their firms, Diana La Muraglia, manager of CW's International Marketing Services said.

A maximum of eight firms are invited to attend, with two participants from each company. Participants are expected to have a technical background, and each will give a presentation on his company's product line and background.

The seminars will take place in Peking, but additional visits will be made to various cultural sites. Participants will meet with Leonard Woodcock, the U.S. Ambassador to China, and will visit several Chinese computer installations.

Confirmed participants include representatives from Mathematica Products Group, Princeton, N.J.; Software AG, Reston, Va.; and Cincom Australia, Crows Nest, Australia. Other firms will be confirming soon, but some room may still be available for those wishing to participate in the March mission.

The second trade mission will take place in May and its topic will be "Data Communications Equipment Selection and Use." The third mission will take place in the fall at a date yet to be decided.

The Chinese have made it one of their national goals to improve their computer expertise and are eager to learn more about U.S. technology, particularly software, according to La Muraglia.

The emphasis of the missions will be on technical information and practical applications. China's DP community is primarily concentrated on scientific and technical applications and is just beginning to focus on business applications, according to La Muraglia. The country currently has a total of 1,500 to 2,000 computers, excluding minicomputers, but is particularly lacking in software development, she noted.

The cost of the two-week mission is $5,800. Any company interested in joining the trade mission should contact La Muraglia as soon as possible at CW Communications, Inc., 375 Cochituate Road, Framingham, Mass. 01701.

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A-32

Zilog Targets OEM Market

(Continued from Page 61)

leagues plan to limit their activities in the microcomputer systems sector to four vertical market niches, which the company will reveal later this year.

Although Zilog officials expect to encounter stiff competition during their maiden voyage in the small business systems world, they feel certain their company's position as an Exxon Corp. venture-capital firm gives them a distinct advantage over most of their potential rivals.

"Because of the financial backing we get from Exxon, people know we're going to be around today and tomorrow and the next day, and for a small business system buyer, the confidence of knowing your vendor is going to survive is extremely important," Hesley explained.

Zilog's first thrust into the microcomputer systems sphere comes at a time when the very-small-business-systems field is at last beginning to come of age. Hesley sees the 1980s as "the decade of the microcomputer" and expects the less-than-$10,000-systems market to total $5 billion by 1982.

With the hope of securing a strong position in that lucrative new market, Zilog has already expanded its systems-manufacturing facility here from an estimated 20,000 sq ft in 1979 to about 60,000 sq ft today, and current construction plans call for the addition of another 30,000 sq ft by year's end.

At the same time, the firm has spent an additional $1 million in capital equipment and, in so doing, has boosted its Systems Division's production rate to about $500,000 worth of hardware each week, according to William Clyde, manufacturing operations director. Zilog's massive investment in new floor space and capital equipment promises to transform it from a company known primarily as a microprocessor manufacturer to one striving for rough equality in its component and systems sales, Hesley said.

To help ensure success in its new venture as a systems manufacturer, Zilog plans to stress the software side of its microcomputer business over its hardware side, Hesley added.

Of the company's estimated 1,000 U.S. employees, about 25 serve as software specialists. By contrast, the design staff for the system division's hardware operations consists of less than two dozen members.

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Genrad, Inc. has entered the semiconductor manufacturing test market through 80% ownership in a new subsidiary, Genrad Semiconductor Test, Inc., which will be located in Santa Clara, Calif. Test systems developed by the subsidiary will be for very large-scale integration and MOS technologies.

– – –

Orbanco, Inc. has sold its two computer software companies, Timberline Systems and Alpine Datasystems, to management personnel of the two firms who exercised the purchase options given them when the companies were formed.

– – –

Hewlett-Packard Co. has opened a Far East headquarters in Hong Kong to oversee the sales activities of its subsidiaries.

NCR Joins MIT Research Program

DAYTON, Ohio – Linking industry with education, NCR Corp. has joined MIT's Industrial Liaison Program, supplementing its own research in semiconductor and related technology.

NCR's participation in the program provides the company with access to MIT's research, staff and literary resources. This will allow the company to observe what is happening in the field of pure research as well as provide a comparison with the other types of research being conducted, an NCR spokesman stated.

Just as the program provides participating companies with an awareness of current research, the interchange also allows MIT researchers to get a feel for what's going on in industry, Dr. Kay Tamaribuchi, program liaison officer, noted. Companies may sponsor work at MIT, and industrial and educational researchers occasionally share in joint projects, he added.

Participating companies pay $30,000 a year in fees which, in addition to providing full access to research information, entitles the firms to discussions with professors and research staff, visits by MIT personnel to the company, access to MIT publications and participation in MIT-sponsored seminars.

Other Participants

In addition to NCR, other computer companies participating in the program include Burroughs Corp., Control Data Corp., Hewlett-Packard Co., Honeywell, Inc., IBM and Texas Instruments, Inc. Approximately 200 firms representing a variety of industries belong to the program, according to Tamaribuchi.

Although the work being done at MIT is pure research rather than product research, working relationships develop between industry researchers and faculty and in this way knowledge passes in both directions, Tamaribuchi noted.

MIT's research budget exceeds $190 million annually. Its research resources include 900 faculty members, 1,400 research staff members and 4,100 graduate students.

Revenues Up But Net Flat In First Quarter at DG

WESTBORO, Mass. – For its first quarter of fiscal 1980, Data General Corp. posted a 31% increase in revenues, but earnings growth was flat.

Revenues for the 12-week period were $137.1 million, up from $104.9 million in the first quarter last year.

Earnings totaled $11.9 million or $1.15 per share compared with earnings of $11.7 or $1.15 per share in the year-ago period.

Other Revenues

Service and other revenues were $20.3 million, up 55% from similar revenues a year earlier, DG noted.

DG shipped 4,100 computers during the quarter, resulting in a total installed base of 74,800 systems.

Employment reached 13,710 workers, up from 11,200 for the same time period in 1978.

DG recently purchased 14.9 acres of land in Manhattan Beach, Calif., for its first company-owned regional customer center.

During the year, the firm will construct a five-story, 125,000 sq-ft office building on the site to house regional sales, systems engineering, field engineering and customer education services for its Western region, which includes southern California, Arizona and New Mexico.

The customer center will enlarge as well as consolidate operations currently carried on in lease and separated quarters in El Segundo, Calif.

The land was purchased from Chevron Land and Development Co. for approximately $8 million.

Rolm Gets Order For $2.5 Million

SANTA CLARA, Calif. – Rolm Corp. has received a $2.5 million order to supply McDonnel Douglas Astronautics Co. with 22 Rolm MilSpec 1666 2nd 160ZB systems.

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The order also includes a software development facility.

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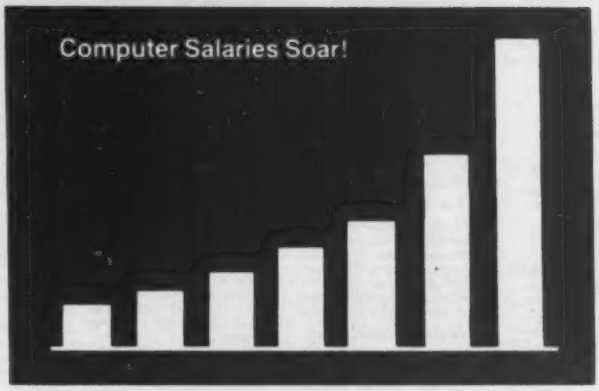

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Multi billion $ NYSE energy related firm. 1+ yrs. exp. COBOL, FORTRAN or PL1 bkdg. Career path oppty.
To $20,000

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Fortune 500 firm. Rapid growth. 1+ yrs. Assembler/DOS/VS/JCL. Able to evaluate & install pkgs.
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ALL POSITIONS RELO & FEE PD.

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DALLAS

SYSTEMS ANALYST .....To $29,000
NYSE manufacturer planning to, implement a new DDP manufacturing/warehousing system with minis and IBM host . . . Lots of professional growth here.

TECH SUPPORT SPECIALIST .....To $28,000
Oil & gas company...303X's - MVS - JES2 - TSO - IMS/VS - NCP/ACF - VTAM/ACF, etc. . . . good career opportunity

PROJECT LEADER .....To $26,000
International manufacturer . . . seeking senior programmer/analyst ready to assume a project leader position in manufacturing system . . . 3033's - COBOL - IMS - TSO.

PROJECT MANAGER .....To $25,500
Insurance Co . . . manage the evaluation/Implementation of larger scale life insurance packages . . . 370 158-DOS/VS-COBOL . . . full responsibility level.

SR. PROGRAMMER/ ANALYSTS .....To $23,000
National consumer goods co. with 370/158-DB/DC has opening for aggressive user oriented professional . . . Good growth situation.

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(214) 363-3300

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PROG/ANALYST

Solid natl corp has urgent need for IMS cobol exp . .TO: $24,000

BANKING

All levels P/A up-IBM or Burr DDA-LOANS-GOOD Cobol
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State of art shop-DOS/VS CICS 1 yr. plus exp-Cobol
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Co desperate! 2 plus yrs exp software techwriting.
.....TO: $22,000

PROJ LDR

Fortune 500 Co-GOOD comm skills IMS/Cobol/Mfg
.....TO: $25,000

Stan Allen
ROBERT HALF
of Tampa, Inc.
1311 North Westshore Blvd.
Tampa, FL 33607
(813) 876-4191

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RPG II PROGRAMMERS

Several local companies need RPG II programmers with 1 or more years experience on IBM, Honeywell or DEC systems. Salary to $18,000.

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3550 N. Central Ave. #1504
Phoenix, AZ 85012
(602) 264-6488

SAN FRANCISCO

SR. SYSTEMS CONSULTANT

Create a large teleprocessing/ data base direction for our client using IBM, MVS, IMS. Needs a strong communicator with Assembler, SNA networks, IMS/ MVS and financial/banking.

SYSTEMS PROGRAMMER

Involves planning and total support of the large scale processing environment, including I/O configuration. Candidates will be considered with 370/303X, DASD + Tape MVS/JCL utilities and SMP/SYSGEN installations.

RESEARCH CONSULTANT

2 years PL1, Cobol/Fortran and NOMAD helpful for duties of design/code financial analysis, investigation of new product offerings and strategic programs.

COBOL PROGRAMMERS

Multiple openings with this state of the art client. Demand far exceeds supply of quality application candidates who wish to stay current and be challenged.

EDP AUDITORS

Solid programming/system design skills with 2 years as an EDP Auditor will be needed for this opening with excellent potential for using your skills and creating new ones. Accounting and a degree required for this high visibility position.

TECH. WRITERS

Our clients are seeking professionals with documentation skills in systems, programming, operations, data entry etc. Prefer some programming bkgrd.

MANAGEMENT ASSUMES ALL INTERVIEW/RELOCATION EXPENSES AND FEES. Your resume or collect phone call can be the start of something new and challenging for the 1980's.

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or
Bob Couch
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of Northern California
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San Francisco, CA 94111
(415) 434-1900

SEATTLE

WASHINGTON bank seeks d.p. audit manager. Prefer 5 yrs. systems analysis or audit experience in banks. Small, growing staff. Top management contact. To $24,000.

IDAHO distributor seeks prog/ analyst. Burroughs COBOL DMS background preferred.
To $24,000

ALASKA bank needs prog/analyst. Prefer 2 yrs. Burroughs COBOL experience. To $24,000.

MONTANA insurance firm wants prog/analyst with 4 yrs. exper. IBM COBOL, ALC or RPG. To $21,000.

Ray Magill
ROBERT HALF
of Seattle, Inc.
1301-5th Avenue
Seattle, WA 98101
(206) 624-9000

ST. LOUIS

PROJECT MANAGER .....To $30,000
St. Louis manufacturing firm seeks systems "pro" with project management experience to lead design efforts for subsidiaries. While degree is preferred (highly) more important is strong design, and programming experience in a manufacturing environment. Position offers excellent visibility in an expanding shop. Heavy user contact.

MANAGER OF PROGRAMMING . . .To $30,000
Manufacturer needs strong technical manager to supervise and develop programming staff. State-of-the-Art "pro" will train programming staff in use of new technology, including data base. An excellent "start-up" opportunity for a strong technical manager. Will be responsible to double programming staff.

ASSISTANT DP MANAGER .....To $20,000
Retailer headquartered in North Suburbs seeks RPGII programmer to function as Assistant DP Manager. At least 2 years RPGII programming and some systems design experience required. Retail and System 34 experience a plus. Excellent growth potential.

SR. SOFTWARE SPECIALIST .....To $28,000
Financial institution expanding its DP shop is searching for a Sr. Software Specialist with 2 years MVS internals experience. IMS, TSO, VTAM desired.

EDP AUDITOR
.....To $30,000
Fortune 200 firm based in St. Louis wants to fill a new position of EDP Auditor. Degree and at least 1 year EDP Audit experience required. Position leads to EDP or Financial Management.

MANAGER, SYSTEMS & PROGRAMMING . . .To $27,000
Supervise 3 prog/analysts. Responsible for design, programming. Plans call for use of IBM 4300's. 5 years design and programming experience required, degree preferred.

FINANCIAL SYSTEMS COORDINATOR .....Low $20's
Coordinate the development and implementation of financial systems System 3 to 4331 conversion. No programming required, but a degree and at least 2 years financial systems experience are. Dynamic, growth oriented firm.

OPERATIONS ANALYST .....Low $20's
Review systems and procedures, identify EDP potential. Flexible, open-ended position with excellent management potential. Degree and inventory systems experience required.

MANAGER INVENTORY CONTROL
.....To $25,000
Midwest firm looking for an inventory and production control specialist with at least 3 years EDP inventory control experience. Corporate level, high visibility position.

DP MANAGER .....Low $20's
Outstate Missouri manufacturer with on-line System 34 wants RPGII programmer to program and manage shop. Standard cost experience helpful.

Charles Shaffer
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of St. Louis
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St. Louis, MO 63105
(314) 727-1535

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You should have a working knowledge of at least two DMS, DLI, ADABAS, IDMS, CICS. Will establish/maintain data base.

RPG II MGRS. or PROG.

To $25,000. System 3/15D shops can use YOU today!

EDP AUDITORS

Excellent opportunity for senior EDP auditors.

SYSTEMS PROGRAMMER

To $32,000. IBM 370, DOS or OS.

SR. SYSTEMS ANALYST

To design/develop large manufacturing systems. IBM or Burroughs. $30-35,000.

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of Northern California
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Palo Alto, CA 94304
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ATLANTA

SYSTEMS ANALYST $26,000
Outstanding position with Fortune Co. Needs degree, DB/DC and State of the Art IBM. Must be career oriented.

PROG/ANALYST $25,000
Excellent shop using 3033, OS/ VS-1 and CICS. Needs agressive take-charge person to lead projects.

PROJECT LEADER . . .$25,000
Needs degree, professional approach. Manuf. design and implementation. Sys. 34 gear RPG II. Very stable Co.

PROGRAMMER $18,000
Opportunity for advancement. Must have Min 1 yr. COBOL. Prefer General Business appls. IBM 4300 on order.

Ray Jennings
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of Atlanta, Inc.
3379 Peachtree Rd. N.E.
Atlanta, GA 30326
404-266-2153

MIAMI

PROGRAMMER/ANALYSTS

International company opening new Data Processing center, looking for Professionals. Your background must include large 370/OS with ability to design and implement financial systems. Opportunity to start on the ground floor with a Prestigous Corp. Must be willing to accept project leaders responsibility. Excellent benefit program. Career advancement dependent on your ability to interface at all levels of management. Outstanding 1980 opportunity. Salary $26,000.

Chuck Neil
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of Miami, Inc.
1395 NW 167th Street
Suite 100
Miami, FL 33169
(305) 625-5433

SOUTHERN CALIFORNIA

PROGRAMMER ANALYSTS

Major financial company requires 3 plus years OS COBOL. Any IMS experience a plus. Starting salary to $25,000.

EDP CONSULTANT

International CPA firm has requirements for several qualified EDP professionals. 4 yr. degree + solid system design exper. CPA a plus. To $35,000 + bonus.

INVESTMENT SYSTEMS

Large insurance company needs a supervisor of the investment systems area to supervise 8. Investment experience a must.
To $35,000.

Contact Duncan White
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of L.A. and Orange County
3600 Wilshire Blvd., Ste. 1914
Los Angeles, CA 90010
(213) 386-6805
6272 E. Telegraph Rd.
Commerce, CA 90040
(213) 721-2197
Contact Gary Dunlap
2333 N. Broadway, Ste. 200
Santa Ana, CA 92706
(714) 835-4103

DENVER

SYSTEMS ANALYST

Exciting state-of-the-art career opp'ty. with a large consulting firm for an analyst with in depth data base exp. Requires some COBOL bckgd. Will be able to work on the ground floor of a distributed processing network. Start to $30,000.

PROGRAMMER ANALYST

Aggressive Denver division of large nat'l. corp. seeks a programmer analyst with solid business applications bckgd. Must have some COBOL and/or BAL exp. with some knowledge of CICS. Will be able to work on both online and batch systems. Start to $24,000.

There are many other good career opportunities currently available in the Rocky Mt. area. If you are interested in obtaining more information please contact:

Steve Newman
ROBERT HALF
of Denver, Inc.
2 Park Central
Denver, CO 80202
(303) 629-1010

LOUISVILLE

D.P. MANAGER

Established Ky. firm seeks a strong manager to be totally responsible for their D.P. area. Financial and personnel systems background company is wanting to grow. Excellent benefits and relocation. Salary to $25,000.

APPLICATIONS PROGRAMMER

Louisville area company is looking for a Business Applications programmer with hospital or insurance claim background. Co. is expanding and wants you to grow with them. Excellent benefits and salary to $23,500.

EDP AUDITOR

Large Holding Co. wants someone who has 2 yrs. experience in EDP audit or a systems analyst with an acctg. degree. This person will be the project leader for several other auditors. Travel is 5-10%. Relocation paid. Salary to $26,000.

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Louisville, KY 40202
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$27,000

Excellent career enhancement in STATE OF ART environment. 1+ years work experience programming in COBOL, BATCH or ON-LINE. Dual 370/158 and 3032. Benefits include 4 WEEKS VACATION and excellent bonus.

$25,000

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Career position offers PROFIT SHARING, TUITION REFUND, MAJOR MEDICAL, 3 WEEKS VACATION and fully paid retirement. 2+ years BAL or COBOL programming and good interpersonal skills. Excellent growth potential in congenial working environment. STATE OF ART 370 OS with IMS and CICS.

$26,000

FORTRAN

If you are a problem solver and have 1+ years experience programming in FORTRAN or PL/1, this could be the opportunity you have been waiting for. Aid in conversion from outside timesharing service to in house. Room for advancement and excellent fringes.

$25,000

RPG II

Excellent growth potential with opportunity to learn CCP. 2+ years RPG programming experience. Applications are financial in this SYSTEM 3/15D data center (38 on order). Highly visible.

$26,000

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Confidentially/professionally

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DAYTON

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Major Mfg is seeking indiv with excellent verbal & written skills to act as liaison between their data processing and fin'l areas. Extensive exp with business appli- and large IBM mainframes are preferred. Advanced degree is a plus but not essential. Indiv's who enjoy a small town environment located near major recreational facilities are asked to respond.

Salary $25-30,000

SR. PROJECT LEADER

Dayton div of a major Fortune 500 seeks a candidate who is promotable to Systems & programming Mgr. Exp with lge IBM mainframes in a manufacturing environment is preferred. Firm is upgrading to a 4341 series by September 1980. MBA is pref but not essential if you have good user skills. Demonstrated leadership skill is a must.

Salary $27-35,000

SYSTEM PROGRAMMERS

Degree. 2 to 3 yrs exp in installation and maintenance of OS/MVS IBM/158. Individual will be assisting CF/MVT team. Must have assembler and COBOL language background. 3 weeks vacation first yr.

Salary $25-32,000

Don Novak ROBERT HALF of Dayton, Inc. First National Plaza Dayton, OH 45402 (513) 224-0500

KANSAS CITY

DEPUTY DIRECTOR

Publicly held midwestern manufacturer/distribution firm with multiple divisions needs strong organizer and systems implementor. Will be responsible for the identifying of divisional needs and the standardization of divisions. Must be familiar with structured design techniques and both on-line and data base design. High visibility to corporate execs and movement to director position in 18 months. Salary High $30's.

MANAGER OF SYSTEMS AND PROGRAMMING

Kansas City based distributor with a phenomenal growth rate needs a take charge leader. Must be capable of taking multiple projects and delegating responsibility to a talented but unlead programming group. Must be familiar with IMS DB/DC and the development of inventory control systems. Will have complete responsibility for staffing new project teams. Salary to $32,000.

DP MANAGER

Publicly held manufacturer with four midwestern divisions needs help. Have out grown their current system 34 and need to upgrade immediately. New 4331 appears imminent. Well organized manufacturing pro is needed to take firm control of this floundering department. Will report directly to the Executive Vice President and have total access to the President. Excellent ground floor opportunity with superb benefits and a management incentive program. Salary to $28,500.

SYSTEMS PROGRAMMER

Excellent opportunity for an experienced DOS/VS systems programmer to install a brand new 4331 with a 4341 on order. Will have complete responsibility to develop a technical support department. Firm is committed to building a large communications network utilizing CICS. Salary $28,000.

SYSTEMS ANALYST

A strong leader will find tremendous challenge with this listed midwestern manufacturer. Prior manufacturing applications required with preference given to MRP, productions scheduling, and inventory control. On-line data base experience a plus. Salary to $25,000.

RPG II

Fast tracked KC based firm with a system III model 15d currently installed seeks a proven RPG II professional. Person will be given complete responsibility for making major systems recommendations to the automation of the company's warehouse. Company offers tremendous challenge in the inventory control area. CCP education will be provided. Successful completion of project will lead to management slot within the firm. Salary to $23,500.

PROGRAMMER/ANALYST

Computer Science degree and/or one year experience in programming either COBOL or assembler qualifies. Company offers latest state of the art equipment and trains in current structured techniques. Programmers are allowed to move as quickly as possible from coding to design. All applications are new development and contain both data base and on-line requirements. Company provides excellent benefits and offers merit reviews. Salary to $20,000.

George Waterman ROBERT HALF of Kansas City 127 West 10th Street Kansas City, MO 64105 (816) 474-4583

BOSTON

IDMS REP.

Leading bus. software developer seeks systematic, articulate pro for marketing & tech support oppty. Heavy client interface. Northeast trvl. Salary $30,000 range.

COBOL APP.—N.H.

Major peripheral mfr. requires shirtsleeve prog/analyst to design, code & implement new mfr. sys. IBM 370 OS, COBOL environ. Interv. & reloc. exp. paid. Salary $22,000 .

MFG. ANALYST

Growing mini-computer vendor seeks strong mfg. analyst to advise top mgmt. in all aspects of BOMP, inventory control, p.o., shop floor planning & MRP. Excellent oral & written comm. skills req. Salary $30,000 range.

OS SYS. PROG.

Prestigious software group of expanding fin'l org. requires heavy to support IBM 370 OS/MVS sys. Mostly new develop. Interv. & reloc. exp. paid. Salary $32,000 range.

RPG INTERNAL CONSULTANT

Prosperous multi-bill. dollar mfr. seeks diversified indiv. with strong RPG skills to consult on internat. EDP sys. w/'ll plan, evaluate, select & implement wide variety of bus. software. Trvl. to Latin America. Salary $27,000.

Contact Gerry Battista ROBERT HALF of Boston, Inc. 100 Summer St. Boston, MA 02110 (617) 423-1200

BUFFALO

SYSTEMS MANAGER

Central NY mfr. needs a seasoned mgr. to take charge of methods, operational planning, scheduling, programming, & systems development depts. Bkgrd. must include multi-plant operations & production control plus a proven track record in supervision. Direct reporting resp. to V.P. of administration. Sophisticated 370/DOS installation. Degree.

$35,000

MANAGER TECHNICAL SUPPORT

Insurance co. located in Western NY needs manager with heavy technical support bkgrd. Resp. include directing all software support functions in a sophisticated IBM/OS shop. BAL, OS SYSTEMS are a must; CICS, VTAM, & IMS are desirable. Large staff provides systems programming & applications support.

$32,000

SENIOR ANALYST

Profitable division of multi million dollar industrial needs analyst to develop MRP systems. Will head up project & must have proven ability in implementation from user side. Key is heavy MRP bkgrd. Degree.

$27,000

LEAD ANALYST

Outstanding opportunity for analyst to join sophisticated, expanding, top notch data center. Must be able to step in and be productive in design & implementation of data base mgmt. systems. IMS is ideal, CICS helpful. Soft goods mfr. located in Western NY has excellent benefits & liberal relocation policy.

$30,000

Pam Siegal ROBERT HALF of Buffalo, Inc. 1310 Liberty Bank Bldg. Buffalo, NY 14202 (716) 842-0801

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COMM. ANALYST

Conn. oppty. for indiv. to direct all IBM network and related TCAM software. Oppty. for occasional trvl. Excellent suburban location . Starting salary to $27,000.

MGR. SYST. & PROG.

Indiv. with DEC exp. to direct fin'l & mktg. oriented dev. group. Must possess people-oriented mgmt. skills! Starting salary to $27,000.

SYST. PROG.

Area oppty for indiv. to direct all IBM software programming. Exp. in IBM OS/VS1, 2 or MVS will be considered. Position leads to tech. mgmt. resp's. Salary to $30,000.

V.P. DATA PROG.

Ins. client seeks indiv. to direct all D.P. functions! Very unique oppty. for sr. exec. to demonstrate skill at corp. office level. Salary to $40,000+.

Stan Durbas ROBERT HALF of Hartford, Inc. 111 Pearl Street Hartford, CT 06103 (203) 278-7170

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$22,000

COBOL PROG/ANALYST

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$22,000

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$26,000

PROJECT LEADER

Outstanding career oppty. with this well known insurance co. IBM 3032 MVS/IMS/VS DB/DC installation. State-of-the-art shop offers exciting challenge.

$25,000

D.P. MANAGER

Relocate to RI & a fast paced retailer. PRIME 400-COBOL/RPG II environment On-Line to Multi-Locations. Co. experiencing astronomical growth, excellent time to get on board.

$27,000

PROGRAMMING MGR.

Rapidly growing mfr. in "Little Rhody" seeks top EDP Technician. IBM 370 DOS/VS RPG II & COBOL shop. Conversion from RJE underway. Report to Controller. Be innovator & decision maker.

$24,000

Dee Ecker ROBERT HALF of Providence, Inc. 400 Turks Head Bldg. Providence, RI 02903 (401) 274-6700

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PROG'S THRU SR. ANALYST

Major recession resistent mfr is seeking qualified DP people. Positions are available for COBOL people with 1 or more yrs exp. Analysts with CICS or TOTAL exp is a real plus. Salary to the Mid Twenties.

TECHNICAL SUPPORT

Prominent Mpls firm needs individual with Hewlett Packard Technical support bkgd utilizing computers in plants and corporate offices. On-line exp in data communication nec'y. Salary to $28,000.

D.P. MGR.

Suburban client offers new position of D.P. Mfr. to person with Sys 3/15D bkgd. RPG-II and CCP exp is nec'y. Systems design exp a big plus. Salary to $30,000.

DIR OF MIS

Ground floor oppty for someone with strong MIS mgmt bkgd. This is a new position with the primary responsibility being the establishment of a mid-size DP center. If you have installation knowledge and want your own center, call on this one. Salary to Lower 40's.

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It's hard to find an opportunity to design and develop an entire DP system from scratch any more! One of our clients can now provide a real chance to take charge of a small/medium scale installation and really express your professional expertise. If you have a serious interest in this type of work, contact us.

$20-30,000

LONG-RANGE SYSTEM PLANNER

Blue Sky for pay? Major manufacturer wants individual who can show the way to go. Business and DP generalist is needed. Current experience doesn't matter but manufacturing, IBM and PL/1 helpful. Several mainframes, largest is a 370-158 OS/VS1.

Dave Weiner/Stan Mundro ROBERT HALF of Wisconsin, Inc. 777 E. Wisconsin Milwaukee, WI 53202 (414) 271-9380

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SYSTEMS PROG

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Suburban mfg. giant offers "Big 3" fringes for IMS internals exp. in state-of-art IBM shop. Data Base position with opportunity for growth. Salary to $30,000

EDP CONSULTANT

Prestigious CPA firm seeks large scale systems design exp. for hi-visibility position with growth potential. Salary $24-32,000.

SYSTEMS ANALYST

S/3-15 D shop using CCP seeks mfg. experience for supervisory duties. Will use RPG II. Salary $22-28,000.

SOFTWARE H'WELL

Unique opportunity avail. if you have GCOS, GMAP experience in large H'well systems. Salary $20-25,000 with generous fringes.

PROGRAMMER ANALYST

Suburban mfr. seeks applic. programmer using COBOL. IMS/TSO a plus in 3033 shop. Mfg/business applics. Salary $22-26,000.

Tom Hing or Chuck McClain ROBERT HALF of Michigan, Inc. 670 Honeywell Bldg. Southfield, MI 48075 (313) 559-1212

WESTERN MICHIGAN

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PROJECT LEADER for "blue-chip" manufacturer. Heavy experience in financial systems needed, some exposure to IBM preferred, OS a plus. $25-30,000.

Joe Grabinski ROBERT HALF of Western Michigan, Inc. 180 N. Division - #302 Grand Rapids, MI 49503 (616) 458-2333

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Communications Software Specialist ..... to $39K
Honeywell (GRTS, NPS) or IBM (TSO, RJE, BISYNC)

Graphics Software Specialist ..... to $39K
Broad expr. TEKTRONIX/other hardware/software

Data Base Software Specialist ..... to $38K
Honeywell (IDS II, DM IV) or IBM (IMS, IDMS, TOTAL)

Systems Programmer ..... to $38K
IBM (OS/VS1, MVS, JES3); Honeywell (GCOS)

Transportation Program Manager ..... to $37K
Marine transportation project mgr.

Computer Performance Analyst ..... to $36K
IBM hardware/software monitors

Systems & Progamming Manager ..... to $35K
Health Care experience, degree required

Training Manager ..... to $32K
Establish/maintain in-house EDP training

Systems Manager ..... to $30K
5 years financial expr. (A/R, A/P, & G/L)

Contracts Administrator ..... to $30K
Hardware/software expr., vendor contact, RFP prep.

Project Leader ..... to $29K
Install DDA, banking applications, COBOL, BAL

Project Leader ..... to $28K
Implement CPCS

Mini Computer Analyst ..... to $28K
HP 3000, Microdata or II Level 6

Programmer Analyst ..... to $25K
Manufacturing, distribution, order entry, COBOL

Programmer Analyst ..... to $24K
Utility, PL1, OS

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GTE Sylvania is a leading developer and manufacturer of sophisticated computer-based systems for the Department of Defense and related agencies. These are realtime, interactive systems which acquire and process electromegnetic signals. Their functions are distributed across multiple processors, are coded in structured languages, use data-base facilities such as DBMS-11, and are interfaced to sophisticated devices such as smart terminals, graphic display terminals, receivers, recorders and transmitters.

GTE Sylvania has a continuing need for innovative software professionals to staff our expanding work programs which involve design, development and support activities in the following areas:

Data base technology	Interactive computer graphics
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Microprocessor controlled systems	Distributed processing

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SOFTWARE VERIFICATION AND VALIDATION..... Plan software test and integration procedures for complex realtime computer systems. Experience in inter-computer interfaces and configuration management desirable.

MICROPROCESSOR SOFTWARE..... Design and develop assembly language software for microprocessor and minicomputer-controlled realtime systems. Implementation of signal processing algorithms, input/output and interrupt handling and realtime executive functions.

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For immediate consideration, forward your resume with salary history to GTE Sylvania, Attn: Dept. CB-7, P.O. Box 188, Mountain View, California 94042. We are an equal opportunity employer, minorities and females encouraged to apply. U.S. Citizenship required.

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1300 Union Commerce Building
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Cleveland, OH 44115

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CACI, a major logistic engineering and systems consulting firm, seeks key individual to fill senior ADP position, excellent opportunity for professional growth, advancement and compensation. Chief programmer to lead team involved with long range data management/data base applications for DOD clients in the supply/logistic disciplines.

Individual will be proven performer with demonstrated technical leadership
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Located in the beautiful Cumberland Valley, the Harrisburg metro area offers short commute, all season outdoor recreation and a family oriented community. CACI offers exceptional compensation with fringe for the truly exceptional professional. If you are a technically superior programmer that enjoys the "Systems Ditch," job satisfaction, responsibility and state of the art environment, please forward resume to Mr. John Boyarski:

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The Indiana Commission for Higher Education is a statewide coordinating board for postsecondary education with responsibilities in the the area of budgeting, program review, planning, data collection and administering federal grant programs.

The Commission seeks a Program Officer who will develop, maintain, modify and operate computerized systems for the review of institutional budget requests. In addition, the Program Officer will participate in the analysis of institutional operating and capital budget requests and will develop computer programs and conduct special studies as assigned.

Minimum qualifications include a Bachelor's Degree in either computer science, economics, finance, accounting or a related field and experience both in computer programming and in financial analysis. Additional desirable qualifications include experience in systems development and in institutional operating or capital budget areas or financial analysis, a Masters Degree in the above fields or MBA and a familiarity with fund accounting concepts. Salary will be in the 20's with comprehensive fringe benefits.

Please send a resume and a letter specifically addressing the above qualifications to:

Mr. Charles C. Seitz
Director of Financial Affairs
Indiana Commission for Higher Education
143 West Market Street
Indianapolis, Indiana 46204

Electronics Engineer (Steward Observatory)

A challenging opportunity in a research oriented group for the person with ability to design, test, and maintain interfaces for mini and micro computer systems used for astronomical data acquisition and data reduction. Main responsibilities include, but are not limited to, repair of Z-80 microprocessor CPU cards, memories, interfaces, and minicomputer peripherals and interfaces. Design/test of various configurations associated with mini and micro systems. Implementation of some analog to digital transducing elements and electromechanical devices for use in instrumentation. Assignments will be received from a senior computer engineer. There will also be an opportunity for close cooperative work with scientists.

QUALIFICATIONS: BA/BSE or equivalent required 2-3 years recent experience with minicomputer and microprocessor design and repair.

Apply by 8 February 1980 to:

Staff Employment
University of Arizona
Tucson, Arizona 85721

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Computer Engineer (Steward Observatory)

A responsible person is required in our research oriented group principally to maintain, adapt, and develop four minicomputer systems, and one mid-sized computer system used for astronomical data acquisition and data reduction. Specifically incumbent is required to repair or supervise repairs of Data General 800 mainframes, computer peripherals, and interfaces. This includes standard commercial products and in-house designed equipment. To design, build, test, or oversee construction of computer interfaces. To consult with scientists and other engineers on design related matters concerning the configuration of systems. To insure standards are properly followed in equipment interfacing. Person must work within a budget and provide long range planning for the development of computer systems. There is no software responsibility expected.

QUALIFICATIONS: 3 to 5 years experience in field service of minicomputer systems. BA/BS or MS in EE depending on experience.

Apply by 8 February 1980 to:

Staff Employment
University of Arizona
Tucson, Arizona 85721

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Digital Needs Data Communications Professionals!

Data Communications Applications Consultants

The Business Systems Applications Group, part of Digital's Data Network Program organization, provides data communications consulting and planning support to our internal business system analysts and programmers throughout the corporation. Rapid growth, through increasing demands for the group's services, has resulted in openings for two professionals with experience in data communications and business systems analysis. Both positions offer high-visibility and in-depth exposure to Digital's internal data processing and communications environment.

Right now, we have an immediate need for an individual to serve as an internal data communications consultant to our Manufacturing and Engineering Systems communities. We also have a need for an individual to support our product lines and our international groups. Both positions require a Bachelor's degree in computer science, or a related field, or equivalent, in addition to a minimum of one year of experience in a data communications environment. Good written and verbal communications skills are a must. A familiarity with Digital hardware and software is preferred.

If you are interested in, and qualified for, either of these positions, please forward your resume, complete with salary history, to Gil Dunn, Digital Equipment Corporation, Dept. C0121 3807, 129 Parker Street, Maynard, Massachusetts 01754.

Communications and Networks

Exciting opportunities currently exist for talented individuals to work with Digital manufacturing as it moves into "Information Resource Management" technologies for the '80s. Right now, Digital's MIS Management is committed to taking the next big step in this direction. And our Communications and Networks Department is responsible for meeting the worldwide communications and networking needs of Digital's fast growing manufacturing organization. This group is currently seeking aggressive individuals to fill the following positions:

Applications Analyst

As Applications Analyst, you will work with other MIS professionals and users analyzing requirements for communication and networks, formulating solutions, performing cost/benefit analyses, making recommendations, and planning and scheduling. Qualified applicants will have five or more years of experience in applications and network analysis, including a solid knowledge of network economics. Excellent oral, written, and interpersonal skills are a must. A knowledge of Digital communications systems, DECNET, and/or ANF-10 would be an asset.

Senior Technical Analyst

Working within the MIS organization to provide network consulting services, you will participate in the support of DECNET based communications systems throughout Digital's Manufacturing facilities. In this capacity, you will assist with configuration, installation, and user training for Manufacturing networks, participate in network performance evaluation, and interface with software development groups to represent manufacturing's needs for network development. In addition, you will work with Applications Programmers, assisting with network interfaces and implementations. To qualify, you should have 3 or more years of experience in network analysis, software development and support. The ability to effectively communicate with all levels of the organization is essential. Experience with DECNET and other Digital products would be a plus.

If you are interested in, and qualified for, any of these challenging positions, please forward your resume, complete with salary history, to Fred Arno, Digital Equipment Corporation, Dept. J0121 3807, 146 Main Street, Maynard, Massachusetts 01754.

Network Planning

Reporting directly to Digital's Data Network Program Manager, you will integrate the activities of many groups into an overall network program plan, in order to guide our internal networking efforts into the future. Duties will include the analysis of user requirements, the evaluation of alternatives, and the estimation of costs. An MS degree in operations research, computer science, or a related field, or equivalent, is required. Good writing and analytic skills as well as previous planning experience and a solid data processing and data communications background are also essential.

Project Management

We need an individual with networking and project management experience to coordinate the introduction of new data communications hardware, software, and services into our internal networks, and to plan and coordinate other projects in the area of network management and performance reporting. A Bachelor's degree in a related field, or equivalent, is required, along with several years of project management experience, including experience with automated project control systems. Good interpersonal skills and an EDP/data communications background are essential.

Network Performance Evaluation

The Communications and Data Systems Group is currently in need of an individual with experience in Digital hardware and software and network performance analysis to study the performance of the hardware and sofware products used in our internal networks, and provide additional support for our network capacity planning. A Bachelor's degree in computer science or mathematics, or equivalent, in addition to solid network credentials are required.

If you are interested in, and qualified for, either of these outstanding positions, please forward your resume, complete with salary history, to Gil Dunn, Digital Equipment Corporation, Dept. C0121 3807, 129 Parker Street, Maynard, Massachusetts 01754.

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The selected individual will assist the Data Administrator in the day-to-day functions necessary to maintain the availability, integrity and security of the division's data and data dictionary. Such functions include DBD and PSB maintenance; copy book maintenance; data base recovery; data base performance evaluations; data dictionary entry and any programming necessary to analyze or to expand the capabilities of the data base environment.

Qualified applicants must possess a Bachelors degree in Computer Science, Operations Research or Business Administration, and have 5 years COBOL/PL 1 experience with 3 years assembler language. In addition, 2 years experience with data base and data base software required.

Please forward resume along with salary requirements to: Rick Copp, Employment Manager

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Function as a Senior Computer Systems Analyst on financial systems. This requires a strong background working with large scale applications systems. Minimum of 4 years experience required with a working knowledge of IBM BAL. Must have the ability to communicate effectively.

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Programmer Analysts

Programmer Analyst participates in program design and performs programming and testing tasks. Must have good understanding of IBM 370-MVS and TSO. Minimum of 2 years appropriate experience required with working knowledge of COBOL and/or BAL.

Sr. Systems Programmer

In our Technical Services Division you will be responsible for the design, and/or evaluation of our IBM Telecommunications Systems (e.g., APC/TCAM, ACF/VTAM) in addition to the implementation of 3705 NCP. You must have 4 years related software and IBM BAL experience, be proficient in BSC, SDLC and/or SNA, and be thoroughly familiar with MVS and MV operating systems.

Telecommunications Analyst

The analyst will design, implement and maintain telecommunication systems for the Bank and its 560 branch offices. Working knowledge should include data communications equipment such as modems, multiplexers/concentrators, data test sets and data carriers. Telecommunications facilities/services, evaluation techniques and vendor/user interfacing skills are also required.

Senior Data Communications Analyst

The senior analyst will design, analyze and implement data networks for the Bank and its 560 branch offices. This individual should be experienced in network configuration design, network performance analysis and network capacity management. Working knowledge should include protocols, network architecture, queueing theory and statistics. Educational background in computer science, math, E.E. or equivalent is desirable.

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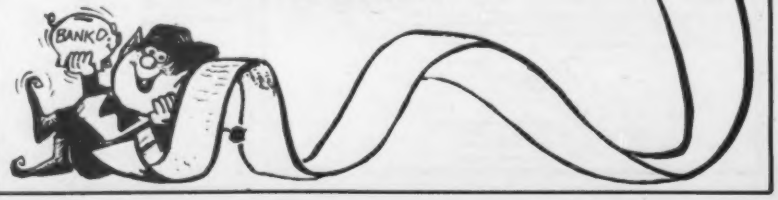

1982

SYSTEMS SOFTWARE PROFESSIONALS

Perkin-Elmer's Computer Operations introduced the first 32-bit minicomputer and is currently leading the field in 32-bit technology. Long term projects and our continuing commitment to developing innovative, reliable software, has created several challenging career opportunities on our talented Software Development staff.

SOFTWARE QUALITY ASSURANCE

We have immediate opportunities for SQA professionals with 3 or more years experience in a dedicated SQA function that requires broad technical background and expertise. Successful candidates may also have extensive user oriented experience, such as in software support services, or may have software development or maintenance experience of 5 years or more and a desire to enter the demanding area of SQA. All applicants must be able to demonstrate proven skills in these areas plus good interpersonal skills used to interface effectively with both technical and non-technical people.

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We need systems programmers who desire to advance themselves in a first line, state-of-the-art, O/S — data communications environment. Successful candidates will work on a number of interesting projects relating to development and maintenance of operating systems, support software, and data communications. Knowledge of assembly language, real time systems, debugging aids, editors desirable.

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Ongoing and imminent projects include optimizing and fast development compilers for FORTRAN, PASCAL, and ADA. Candidates should have a strong background in compiler construction from either industry or academic experience as well as proficiency in assembly language and FORTRAN or PASCAL.

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Must be knowledgeable in fixed and floating point arithmatic operations including multiply/divide algorithms. Experience in microprogramming bit slice architectures is required. 3 to 5 years experience plus degree in Math, Computer Science or EE preferred.

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SYSTEMS PROGRAMMER

Applicant must have 3 to 5 years experience as a systems programmer. COBOL, and ALC with CICS internals are required. Firm utilizes IBM 370/138 DOS/VSE. VTAM, VM, VSAM and data base experience are an asset. **Send resume and salary requirements to Personnel Office, Blue Cross of MT, P.O. Box 5004, Great Falls, MT 59403. Phone (406) 761-7310.** An Equal Opportunity Employer.

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SYSTEMS ANALYST

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Desire a knowledge of OS/VS operating systems as well as CICS. Will evaluate systems component loads as well as install and maintain operating systems. Two months company paid training for the future incumbents will begin February, 1980.

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FLORIDA

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Public Schools,
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Medium size casualty insurance company located in Nassau County. Must be familiar with IBM equipment. Position reports to V.P. —MIS. Requirements include ability to restructure department and implement new systems; on-line experience, BAL programming and heavy JCL. Strong growth potential.

Please send resume including salary requirements to CW Box 2176, 375 Cochituate Rd., Route 30, Framingham, MA 01701.

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An immediate position is available for a Computer Programmer with at least 1-2 years programming experience on an NCR CENTURY Computer, or NCR CRITERION Computer. Experience should include NCR's NEAT/3 language level I or II, or COBOL. Programming in business applications is helpful.

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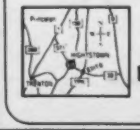

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The University of Wisconsin-Oshkosh invites applications for two tenure track positions in the Computer Science Department. An M.S. in Computer Science plus experience is required (Ph.D. preferred). rank is open and commensurate with qualifications/experience and salary is negotiable and competitive. University facilities include an IBM 370/148 and DEC 11/70. Department facilities include DEC 8/L, 11/05 and 11/45. Courses currently offered include data structures, computer architecture, artificial intelligence, programming languages, simulation, computer graphics, database systems, operating systems, compiler construction and other service courses. Closing date is February 15, 1980 and the starting date is September 2, 1980. Applicants should send a resume, copy of graduate transcript and 3 letters of reference to **Dr. Andrew L. Perrie, Chairperson, Computer Science Dept., University of Wisconsin-Oshkosh, Oshkosh, WI 54901.** UW-Oshkosh is an Affirmative Action/Equal Opportunity Employer.

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SR. PROGRAMMER-IBM systs 3-15D, CCP	to 28K	SYSTS. ANAL.-IBM 370/DOS, COBOL, S&L exp.	to 26K
SYST. PROG.-IBM 370/OS/MVS/IMS	to 27K	PROGRAMMER-IBM 370/DOS, CICS, Bal/COBOL	to 23K
SYSTS. PROG.-UNIVAC 1100, DMS, QLP	to 26K	SYSTS. PROG.-IBM 370/DOS, CICS	to 27K

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McRae's, Inc., one of the South's leading retailers, is expanding it's Data Processing staff. We have immediate openings for the following positions:

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Maintain NCR Criterion system utilizing VRX, TOTAL, TICS, and large POS network. Responsible for all communications and systems software. Data Base experience helpful.

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2-5 years experience with general systems. COBOL, DB/DC systems a plus.

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McRae's, Inc.
Personnel Department
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To implement and maintain software components, data base software and remote entry services software. The ideal candidate would possess a degree in Business, Computer Science or Math with a minimum of 5 years programming experience including CICS, OB/VSI and VM/CMS. Experience in DOS/VS desired.

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To develop, analyze, promote and implement accounting and business (commercial) computer applications in the areas of personnel, administration, accounting, exploration, mining, milling, engineering, and R & D. The ideal candidate would possess a degree in Business, Accounting or Computer Science and have a minimum of 3 years experience, preferably in the mining industry. Must be proficient in COBOL and experienced in CICS.

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To analyze, program and implement technical computer applications in the areas of exploration, mining, milling, engineering, and R & D for worldwide uranium operations. The ideal candidate would possess a BS in Math, Computer Science or Engineering and have a minimum of 2 years experience, preferably in the minerals industry with proficiency in high level B/S Program Languages (FORTRAN, PL/1, etc.) preferred.

Qualified candidates should direct their resumes, including salary history to:

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General Business Applications Programmer/Analysts
Design, develop, and implement systems in support of worldwide general accounting, financial planning, cost accounting, personnel, facilities and marketing functions. Experience with IBM 370, minicomputers, IMS, COBOL, or DL/1 applications preferred.

Manufacturing Systems Programmer/Analysts
Design, develop, implement and support shop tracking, production planning and quality tracking applications for worldwide manufacturing systems. Experience with IBM 370, minicomputers, COBOL, PASCAL, IMS or DL/1 applications preferred.

Scientific Applications Programmers
Develop and support computer aided design and interactive graphics applications. Experience with IBM 370, minicomputers, COBOL, FORTRAN, PASCAL, data base management, numerical methods and structured programming preferred.

Data Base Analysts
Design, develop and support IMS data bases and support programmers with consultation, debugging and design assistance. 3-5 years experience with DL/1 applications programming and IMS data base design required.

Data Base Development
Design, implement and support new CODASYL data base management system for the TI-990 series minicomputer with emphasis on support in a distributed processing environment. 5-8 years experience in data base systems implementation experience preferred.

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Modify and troubleshoot IBM operating system. 3-5 years experience with IBM operating systems and recent experience with MVS/JES 3 or TSO.

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Teach and conduct computer lab workshop involving a broad base of computer systems technology. All education will involve internal systems and services personnel worldwide. Includes broad curriculum and technical assistance to key systems projects. Involves courses using the TI-990, IBM 370/3033/4331/4334 education.

If you wish to work in this highly motivating and challenging environment, send your resume in confidence to: John Heft/ P. O. Box 2103/Richardson, TX 75080.

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A minimum of 2 years data center experience with large scale IBM systems.

APPLICATION PROGRAMMERS

2 years COBOL programming experience. Background should include experience in new application development. Major systems design responsibility desirable, and distribution experience helpful.

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A minimum of 3 years programming with either MVS or IMS experience.

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A minimum of 5 years systems design experience, preferably with IMS background.

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The H.E. BUTT GROCERY COMPANY, headquartered in CORPUS CHRISTI, Texas has long been considered an ideal vacation and work location. We offer a big city atmosphere with small town benefits. Recreational opportunities are available year round, including such things as golf, tennis, fishing, and a multitude of other outdoor activities.

If you are interested in these exciting career opportunities, excellent salaries, a full range of benefits, including dental insurance and paid relocation to Corpus Christi and seek a stimulating environment where the opportunity to grow professionally is virtually unlimited, then we should talk.

An interview may be arranged by submitting a brief description of your work history in confidence to:

Jay Johnson-Greer

H.E. BUTT GROCERY COMPANY

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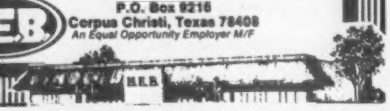

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Client cos pay all employment costs. Contact, in confidence, **Don Goona, (215) 561-6300, FOX-MORRIS ASSOCIATES, 1500 Chestnut, Phila, PA 19102.**

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Candidates must have 7 years computer operation experience using DOS/VS and/or OS/VS1. DOS to OS conversion is a plus. Applicant should possess management or supervisory experience with strong administration capabilities.

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Donna Turner
800-354-9508

In the state of Kentucky call collect (606)268-5383

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- Telecommunications experience (PRONTO) an asset.

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- Should be knowledgable in DEC Operating System (RSX-11M)
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Our State-Of-The-Art IBM environment comprises OS/MVS COBOL 370-168 and dual IBM 3033s. If you possess the basic qualifications and want a salary, benefits and exposure that will put you ahead, and would like to be considered for these positions, please contact Mr. Charles Guder, 212-490-5191 or mail resume to his attention:

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Positions require two or more year's experience in at least one of the following areas: systems programming for IBM or similar operating systems, plus a solid understanding of systems software design and implementation techniques. Experience in designing and implementing control systems software such as Database, Data-Communications, DataDictionary, Query, or Interactive Systems, Transaction Processing Systems, Tele-Communications Monitor, Network Protocols, or background in on-line applications, using 3270 type terminals in a TP Monitor Environment. Knowledge of interactive and pseudo-conversational programming techniques very helpful.

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Positions require formulation/development of new Report Generator/Retrieval Software Features to interface with new projects, and coding in IBM ASSEMBLER LANGUAGE additionally, formulation, design and implementation (using COBOL) of new product features and new environments for a financially directed software tool. Position affords exposure to a diversity of hardware, operating systems, and database management systems (DBMS). Hardware environments include IBM, Burroughs, NCR, Honeywell, Univac, and several mini-computer systems.

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Personnel Department
City Hall
P.O. Box 1857
Appleton, Wi. 54913

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COMPUTER SPECIALIST

Immediate opening for programmer-analyst to develop data processing tools and procedures for solar energy. Masters degree in data processing or minimum 3 years data-base management experience required. Must have programming experience and communication/teaching skills. Solar energy background desirable. $20 to $24 K. Submit resume to **Western SUN, 921 S.W. Washington Street, Portland, OR 97205 by January 31, 1980.**

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Parker Brothers, world renowned as one of the leaders in the Toy and Game industry continues to expand its data processing department and is looking for a qualified individual to join its new corporate headquarters in Beverly, Massachusetts.

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Here is a chance for you to utilize your talents in the analysis, design and implementation of a new state-of-the-art net-change MRP Manufacturing System.

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50 Dunham Rd.
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COMPUTER PROGRAMMER

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For more information and appointment please send your resume to our Personnel Director.
Mr. R.S. DiSalvio

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Excellent opportunity with sophisticated health care on-line data processing system encompassing all phases of a complex acute care hospital. Excellent fringe benefit package with competitive salary.

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To qualify, you should have a strong data communications background including experience with protocols, modems, networks and telecommunications — hardware and software. Prior experience with large IBM systems or 3270 networks is desirable.

We offer excellent salary and benefits including profit sharing, stock purchase plan, stock bonus plan, medical and dental insurance. Please send your resume, including salary history, to Merle Halverson, Professional Recruiting, Wang Laboratories, Inc., Dept. C-2, One Industrial Avenue, Lowell, MA 01851.

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Prog/Anal. (On-line)	To 30k
Prog/Anal. (CICS)	To 25k
Syst. Programmer (CICS)	To 33k
Software Eng. (NOVA, 8080)	To 30k

Employer retained agency, call or send resume to:

COMPU SEARCH

50 CALIFORNIA STREET, SUITE 3550-A
SAN FRANCISCO, CA 94111
(415) 362-0911

800 MENLO AVENUE, SUITE 217-A
MENLO PARK, CA 94025
(415) 328-8024

SPERRY UNIVAC

Sunbelt Opportunities for SYSTEMS ANALYSTS

Sperry Univac's Southern Operations is actively searching for experienced Systems Analysts for various locations throughout the Sunbelt. The challenges afforded by our diversified systems and client needs, offer Systems Analysts the opportunity to expand and shape their own careers.

These positions require a broad systems analysis background including experience with Exec 8, TIP, DMS, CMS, Systems Generation and Dump Analysis. Previous UNIVAC 1100 series experience would be a plus.

Sperry Univac offers the qualified candidate an excellent salary and fringe benefit program, as well as an outstanding internal and external training program. All interested candidates should forward their resumes, including salary history, in the strictest confidence to:

B.L. Freedman, Manager,
Field Personnel
Sperry Univac
6700 West Loop South
Bellaire, Texas 77401

SPERRY UNIVAC

Sperry Univac is a division of Sperry Corporation.
We understand how important it is to listen.

An Equal Opportunity Employer M/F

Software Technical Writers

Here's your chance to get involved with today's leading producer of computer software. And move ahead with a company that's in a class by itself. Right now, one of our most prestigious clients is looking for software specialists with career aspirations to join them. As a Massachusetts data-base software firm, our client boasts a unique approach to computer software. Within their dynamic progressive environment, you'll find yourself in a position where you'll truly prosper and grow. If your looking to make a really rewarding change, now's the time to contact Norton, Kleven. After 10 succesful years, our staff of former industry professionals can give you the finest confidential consultation available.

Challenging software documentation positions are available for Technical Writers with two or more years experience as a Programmer/Analyst or as a Software Technical Writer. Specific assignments will be in the following areas:

DATABASE PRODUCTS - Prior experience as a COBOL or PL/1 programmer. Exposure to a database system is preferred, but not required. Some knowledge of large IBM systems and JCL.

DATA DICTIONARY PRODUCTS - Familiarity with COBOL is a must; exposure to a commercial data dictionary and/or database systems is a definite plus. Requires ability to master the product on both a conceptual and technical level, and to functionally cross-reference components of multiple Data Processing and Manual Systems.

DATA COMMUNICATIONS SYSTEMS - Familiarity with COBOL, PL/1, or ASSEMBLER. Exposure to a commercial data communications and/or database systems is preferred. Requires some knowledge of IBM or similar systems, and an ability to master concepts of interactive programming tools/techniques and operating systems functions from a writing standpoint.

Candidates for all positions must be able to work closely with development teams and use their products to the extent necessary to write sample programs and/or generate examples. Duties of positions include preparation of User Training Materials for all software products.

So call, Norton, Kleven at (617) 861-1020, today and ask Simone Zani about these exciting opportunities to join the best in computer software.

nk Norton, Kleven and Co., Inc.
INDUSTRIAL RELATIONS MANAGEMENT CONSULTANTS
Three Fletcher Avenue, Lexington, Massachusetts 02173
Telephone (617) 861-1020

Member
Massachusetts Professional Placement Consultants
National Computer Associates. (Offices Nationwide)
Representing Equal Opportunity Employers M/F

Competitive Analysts

Digital's Technical Products Group in Marlboro, Massachusetts has several key positions available for talented individuals to assume responsibility for providing Digital marketing and sales personnel with a complete analysis of competitive products and marketing strategies, including both product and regional marketing to define and implement new product and operational strategies.

In these high visibility positions, you will report to the Group Marketing Manager with responsibility for cross products marketing and planning. You will also participate in important interaction with senior management in other product groups as well as with Corporate Marketing.

Ideally, you should have a combination of front line and strategic planning experience in addition to a BSEE/CS, or equivalent. A strong background in computer systems acquired from experience in sales/marketing or software is important. Excellent verbal and written communication skills are essential. An MBA would be preferred.

Located in Marlboro, Massachusetts, only 30 minutes away from Boston, this position will enable you to enjoy some of the best of rural New England living — while keeping you close to the cultural and entertainment resources of the city. You will be in close proximity to the summer seaside retreats of Cape Cod, fantastic skiing on the slopes of New Hampshire and Vermont, and excellent schools and shopping centers.

If you would like to investigate the challenges and opportunities that await you at Digital, please forward your resume, complete with salary history, to Carol Reed, Digital Equipment Corporation, Dept. G0121 3807, 200 Forest Street, Marlboro, Massachusetts 01752. We are an equal opportunity employer m/f.

digital

Field Support Analyst

San Francisco Peninsula

Sunnyvale, California, thirty-five miles south of San Francisco, is the electronics capital of the world. In addition to being close to the beaches and mountains, a temperate climate allows year 'round recreation. Sunnyvale is conveniently located between San Francisco and San Jose providing the cultural aspects of San Francisco and the challenging opportunities of the "Silicon Valley".

As a Field Support Analyst for Control Data Corporation, you will provide technical and consulting support to customers worldwide on communications and network software for CYBER 170. Communications and large systems experience are necessary to perform the following tasks:

Problem Diagnosis
Development & teaching seminars
Consulting to customers
Technical writing
Special project design/ implementation

Control Data Corporation offers an excellent salary and a generous benefits package including RELOCATION ASSISTANCE. For immediate consideration, please call or submit your resume to K. Beaudet, Control Data Corporation, 215 Moffett Park Drive, Sunnyvale, CA 94086. (408) 734-7434.

CONTROL DATA CORPORATION
More Than A Computer Company
An Affirmative Action Employer

OVERSEAS EMPLOYMENT

Saudi Arabia

Programmer/ Analyst

Global Associates, an international base operations and support services company, has an immediate opening at their Saudi Arabia facility for a Programmer/Analyst.

Minimum 2 years' fiscal systems programming and 2 years' fiscal system design. Proficiency in ICL Hardware/ Software COBOL.

Qualified, interested individuals send resume to:

K.A. Ringwood
Global Associates,
Dept. 212
P.O. Box 12156
Oakland, CA 94604

GLOBAL ASSOCIATES

An equal opportunity employer

frank leonard personnel

FLORIDA CAREERS IN THE SUNSHINE

LARGE, MODERN, TECHNICALLY SOPHISTICATED CLIENTS located in the SUNSHINE STATE have requirements for PROGRAMMER ANALYSTS, SYSTEMS ANALYSTS and DATA BASE SPECIALISTS who have experience in **ANY** of the following areas: IBM, CICS, IMS, COBOL or ASSEMBLY LANGUAGE. Please submit RESUME including SALARY HISTORY or CALL:

FRANK LEONARD PERSONNEL
1211 N. Westshore Blvd., Suite 100
Tampa, Florida 33607
813-872-1853

typesetting systems programmers

Experienced with driving phototypesetters from mini or micro computers or in working with graphics displays or pagination.

Positions available in our offices in Florida and Bloomfield, Connecticut.

CALL OR SEND RESUME TO:
MR. ED COHEN
ALPHAKEY SYSTEMS
An Alphatype Company
98 West Dudley Town Road
Bloomfield, Connecticut 06002
800-243-8317

An Equal Opportunity Employer

MANAGER SYSTEMS AND PROGRAMMING

Progressive Data Processing installation seeking manager for staff of 25. Responsible for application development, systems software, and maintenance activities.

Minimum of 3 years management experience in D.P. and an additional 3 - 5 years' experience in systems analysis and programming, including DATA BASE and on-line systems. COBOL, OS/VSI experience a must. Degree preferred. Current environment IBM 370/158 DOS/VS converting to OS/VSI. On-line program development. Long range systems planning in development.

Starting salary commensurate with experience. Excellent fringe benefits. Send resume with salary requirements to:

Personnel Department
BLUE CROSS OF NORTHWEST OHIO
3737 Sylvania Avenue
Toledo, Ohio 43656

Equal Employment Opportunity
and Affirmative Action Employer

SENIOR SYSTEMS ANALYST

Challenging New Opportunity With Burger King in Miami

Burger King, a rapid growth leader in the food service industry and an expanding division of Pillsbury, a Fortune 200 corporation has created a new position for an experienced systems analyst in our Miami headquarters. You'll have the creative freedom you need to design and implement managment information systems in such areas as personnel and accounting.

Qualifications include a good business knowledge with a Disciplined Systems Development approach; 5 or more years experience and a working understanding of personnel, accounting and other management systems; strong supervisory and project management, and communication skills; and a solid business acumen. Exposure on IBM 370, and/or user contact is helpful. A Business or Finance degree is desired, an MBA preferred.

We offer an excellent salary, comprehensive benefits, high visibility and exceptional challenge. For prompt, confidential consideration, please submit your resume to: Employment Dept.

BURGER KING CORPORATION
General Mail Facility
P.O. Box 520783
Miami, Fl. 33152
An Equal Opportunity Employer M/F/H

BURGER KING

Database Administrator

Rapidly expanding national third party benefit administrator has need for database professional to assist in analyzing our computerized information requirements and determining the feasibility/desirability of the database approach for new applications. Bachelors degree in Computer Science or related field. At least two years of database designs nd development experience required. Prefer user of DMS/1100 or other CODYSL data package. PCS currently utilizes a UNIVAC 1100 large scale mainframe. We offer excellent benefits and unlimited growth opportunity. Send resume.

M. Franklin
Personnel Manager
Pharmaceutical Card System, Inc.
P.O. Box 20831
Phx., Az. 85036
EOE M/F/H
Subsidiary of Foremost-McKesson, Inc.

SYSTEMS PROGRAMMER

Bachelor's degree and a minimum of four (4) years programming experience (one year of which must have been in systems programming related tasks in a DIOS/VS environment); proficiency in assembler language also required.

Salary Range: $20,672 - $28,794
Date of Vacancy: Immediately
Deadline for receiving resumes: February 4, 1980
Submit resumes to:

Division of Personnel Services
The School Board of Broward County, Florida
1320 Southwest Fourth Street
Fort Lauderdale, Florida 33312

An Equal Opportunity Employer using Affirmative Action Guidelines.

DATA PROCESSING MANAGER

United California Bank has an immediate opening available for a Data Processing Manager in our Administrative Services Division. This newly created position will manage a team of senior analysts who will be responsible for bankwide establishment of policy, guidelines, objectives, and administrative controls for distributive data processing.

Involvement will include the central evaluation of mincomputer hardware and software, the central control and coordination of mini-computer selection and application to Banking Systems, and the establishment of security measures for protection of Bank data. This position will also control applications which will utilize inhouse and outside time sharing.

The professional we are looking for should have extensive background in distributive data processing, strong managerial capabilities, plus an indepth knowledge in the areas of:

- **data and systems security**
- **software systems and hardware evaluation**
- **data communication**
- **mini-computers**
- **contract negotiation**

If you meet these qualifications, please send resume with salary requirements in confidence to:

UCB UNITED CALIFORNIA BANK
Ms. N. Larson
707 Wilshire Blvd., W5-6
Los Angeles, CA 90017

EOE

JAMES MADISON UNIVERSITY PROGRAMMERS AND ANALYSTS

James Madison University, located in the Shenandoah Valley of Virginia, is seeking programmers and analysts to implement an on-line Comprehensive Student Records system. Experience should include ANSI-COBOL and data-base design in an on-line environment. Preference will be given those with HP3000 experience. Starting salary: $13,128 - $17,150 depending on experience. Submit resume to **Personnel Office, James Madison University, Harrisonburg, VA 22807. Closing date: February 15, 1980.**

James Madison University is an EQUAL OPPORTUNITY EMPLOYER.

Instructor of Computer Science: Tenure-track, full-time teaching position starting August 1980. Master's degree in Computer Science required. Training in mathematics or physics and experience with PDP-11 RSTS/E preferred.

ALSO:

Programmer/Operator: Bachelor's degree in Computer Science, Mathematics, or Physics with a minimum of 12 semester hours of undergraduate programming experience required. Experience with the PDP-11/34a, RSTS/E, and W.I.S.E. is desirable.

Send resume and transcripts to Mr. Eugene Kohlbecker, Box 1091, MacMurray College, Jacksonville, IL 62650. An Equal Opportunity/Affirmative Action Employer.

Systems Supervisor

TI in Johnson City, TN

Participate in the design, development and implementation of management systems for marketing, manufacturing and financial applications. Supervision of management systems programmer/analysts and distributed processing hardware headquartered in our Johnson City, Tennessee facility. Provide interface between site users and related functions in other TI locations. Experience in design and implementation of major manufacturing systems and experience in management technical support functions desirable. BA/BS in Computer Science or Engineering degree required. MBA/MS desirable.

Texas Instruments is building a new electronic technology center in Johnson City, Tennessee. Construction is already underway on a new 121-acre site set on the edge of the Appalachian Mountains. There's tremendous growth ahead, with a lot of room to move up in the beautiful Great Smokies.

This country is one of America's scenic treasures. In Johnson City, you are close to white water rivers, historic houses and villages, ski slopes and the Appalachian Trail. And Johnson City is a progressive, attractive city. It's a regional medical and educational center — the home of four hospitals, East Tennessee State University and one of the most highly rated school systems in the state.

TI Johnson City. A good move. Especially if you want to move up.

Call collect to Les Shroyer (617) 222-2800, ext. 3374. Or send your resume in confidence to: Don Colanton/34 Forest St., M.S. 12-3/Attleboro, MA 02703.

TEXAS INSTRUMENTS
INCORPORATED

An equal opportunity employer M/F

PROGRAMMER/ ANALYST

Here's your chance to join the Ronson Corporation. We produce lighters, food preparation products and aerospace products used throughout the world.

Ours is a DOS environment utilizing IBM hardware. Knowledge of COBOL is a must. Previous experience with commercial systems is required. Emphasis will be placed on taking a program from inception to completion.

We offer an attractive salary and benefits package. Please send resume, including salary requirements, in confidence to:

Personnel Manager

RONSON
CORPORATION
1 Ronson Rd., Bridgewater, N.J. 08807
An Equal Opportunity Employer

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SYSTEMS ENGINEERS

Brown & Williamson, third largest tobacco manufacturer in the U.S., is seeking programmers/analysts to work in our corporate Information Services Department. Initial responsibility will be programming leading to involvement in business systems analysis and design. College degree preferred with 1-6 years' experience. IBM 370 OS/VS, PL/1, FORTRAN or ALC experience desired, but will consider other programming background.

If interested, please submit resume including experience and salary history to:

Mary Lou Kruthoffer
BROWN & WILLIAMSON
TOBACCO CORPORATION
1600 West Hill Street
Louisville, KY 40210

SYSTEMS PROG $23-35k

TECH SUPPORT SPECIALIST

Leading Retail firm located in Central NJ, seeks Senior Systems Programmer with 2-5 years exp working with OS Internals, SYSGENS, TSO Internals. VTAM helpful, but not required. Will be responsible for installing and maintaining Teleprocessing Systems including NCP-GENS, PTF applications, and DEBUGGING; assisting in designing an overall T.P. Network.

Coupled with an exceptional opportunity for growth and intensive management seminars at HARVARD, company offers complete benefits featuring dental plan, stock option, pension plan, bonuses, full tuition and 3 weeks paid vacation after 1 year. For more info call or write JOE RILEY at 201-467-8700 at 55 Morris Ave., Springfield, NJ 07081.

STEEPLE
Associates, Inc.
SPRINGFIELD

INFORMATION SYSTEMS OPPORTUNITIES

Pratt &Whitney Aircraft, a Division of United Technologies Corporation, has a number of openings in West Palm Beach, Florida. We offer a professional environment with state-of-the-art equipment. An appropriate degree and experience is required.

APPLICATIONS SYSTEMS ANALYST/PROGRAMMERS

- Manufacturing Applications
- Financial Systems
- Product Support Systems

Desirable background will include: two to ten years experience, extensive COBOL programming, OS/VS JCL on large IBM Computers, on line systems experience, Systems Analysis and Design, and well developed writing and communications skills.

TECHNICAL SUPPORT ANALYST

Candidate should have one to five years experience in MVS, telecommunications, VASM, TCAM, 3705/NCP, VM/CMS, Graphics, and Plotting Support.

EQUIPMENT EVALUATION ANALYST

Candidate should have one to five years experience and some background in computer performance measurement and capacity planning.

DATA BASE ADMINISTRATION ANALYST

Desirable background will include: IMS/VS DB/DC in large scale MVS environment, Application Design, Logical Relationships and Data Base Design, maintaining Data Dictionary systems, and developing IMS DB/DC Education Programs.

Send your resume including salary requirements to:

PRATT & WHITNEY AIRCRAFT GROUP
PROFESSIONAL PLACEMENT DEPARTMENT BH 106
Government Products Division
P.O. Box 2691 Mail Stop R-77
West Palm Beach, FL 33402
An Equal Opportunity Employer M/F

PRATT & WHITNEY AIRCRAFT GROUP UNITED TECHNOLOGIES

DATA PROCESSING PROFESSIONALS

DISCOVER THE OPPORTUNITY AT SDA... WHERE YOU BELONG.

SDA is a full-service company providing professional services, products and training.

We're looking for qualified individuals who are achievement-minded and who have experience as a Project Manager, System Analyst or Programmer/Analyst to help us sustain our 12 year commitment to excellence.

Requirements for these positions include experience with major languages and on any systems. Database or telecommunications skills a plus.

Give your career the continual stimulus it needs for you to stay at the peak of your profession. We offer competitive salaries and comprehensive benefits, including the best vacation policy in the DP industry. AND aggressive opportunity for you to grow.

Call collect or send resume to:

SDA
SOFTWARE DESIGN ASSOCIATES, INC.
Corporate Personnel (212) 686-2032
260 Madison Avenue New York, NY 10016
An Equal Opportunity Employer M/F

Positions are available at SDA offices listed below.
New York City-Chicago-Philadelphia-Union NJ- Norwalk & Hartford CT-London, England

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DIRECTOR DATA PROCESSING

Rapidly growing Southeastern City is seeking a qualified individual to manage an online, interactive data base system. This individual should have experience in personnel management. Candidates must have strong background in communications and data base operations. CS Degree plus 5-7 years experience in application management desired. Experience in operation of OS/3-IMS90 helpful. Salary to $30,000. We offer a career opportunity. Send resume and references to:

Max Rhoads, City Manager
City of Owensboro
P.O. Box 847
Owensboro, Kentucky 42301

An equal opportunity employer.

SYSTEMS AUDITOR

A major North Carolina bank has an immediate opening for a SYSTEMS AUDITOR in the AUDIT DEPARTMENT. This Charlotte, North Carolina-based position requires a relevant degree, 2-4 years experience in programming and systems design. Experience should be on third generation equipment and should include a knowledge of OS, JCL and COBOL. Strong accounting and/or auditing experience preferred.

Equal Opportunity Employer

PROGRAMMER ANALYSTS

Do you have 3 - 5 years of experience in real-time process control? Interested in a small company atmosphere? Interested in taking jobs from design through implementation? Have experience on minicomputers in FORTRAN, BASIC and assembly language? Then we are interested in hearing from you!

We are an international company specializing in process control applications. Steelmaking experience is a plus. We offer excellent salary and benefits, including profit sharing and medical insurance. Please send your resume including salary history to:

Process Corporation
P.O. Box 11528
Pittsburgh, PA 15238

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frank leonard personnel

FLORIDA BANKING D.P. PRO'S

SEVERAL LARGE, MODERN, TECHNICALLY SOPHISTICATED FINANCIAL INSTITUTIONS are looking for TALENTED PROGRAMMER ANALYSTS who are SEEKING STATE OF THE ART TECHNOLOGICAL CHALLENGE and GROWTH.

We are interested particularly in those INDIVIDUALS who CONSIDER themselves ABOVE AVERAGE in BANKING APPLICATIONS on IBM equipment using COBOL or ASSEMBLY language. Please submit RESUME including SALARY HISTORY or CALL:

FRANK LEONARD PERSONNEL
1211 N. Westshore Blvd., Suite 100
Tampa, Florida 33607
813-872-1853

DIRECTOR OF COMPUTER SERVICES OHIO UNIVERSITY

Ohio University, a state supported university in the beautiful hills of Southeastern Ohio, invites applications for the position of Director of Computer Services.

Computer Services has a staff of forty-three, a budget of almost $1.5 million, an IBM System 370/158 computer operating under VM/370 and VS1 and more than one hundred terminals to serve the students and staff.

This position is responsible for the management of and planning for centrally administered computer facilities at the University. Qualifications should include at least five years experience managing a relatively large computer facility and a minimum of a master's degree or equivalent. The salary range is $27,000 to $29,000.

Application closing is February 8, 1980, Send your letter of application and resume showing experience, education, and references to:

Dr. Gary Moden
Chairperson, Search Committee
Haning Hall, Room 216
Ohio University
Athens, Ohio 45701

An Equal Opportunity Employer

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DATA PROCESSING

Motorola's Government Electronics Division, located in warm, sunny Phoenix, has immediate openings for candidates seeking advancement opportunities in designing and programming business system applications for IBM 370.

SENIOR PROGRAMMER/ANALYSTS PROGRAMMER/ANALYSTS

Degree or equivalent, minimum of 2 years related experience and knowledge of one or more of the following:

- COBOL
- O/S JCL
- IMS DL-1
- TSO & IBM UTILITIES
- PANVALET

Motorola GED is a rapidly expanding, multiple product organization. We are located in one of the most desirable climates in North America. If interested, please forward resume and salary history to:

Dotti Morris
Department 617

MOTOROLA
Government Electronics Division

8201 E. McDowell Road
Scottsdale, Arizona 85252

An Equal Opportunity/Affirmative Action Employer
U.S. Citizenship Required

EDP OPPORTUNITIES

MGR Software MVS $45K
SYSTEMS Anal Communicat on, COBOL Database $26-31K
INTERNAL Cnsltnt-25% N.E. trvl plant financial $35K
SYSTEMS Engr BS MS EE Pascal Fortran PL 1, RT $38K
PROJ Mgr DOS/VS COBOL SHADOW $35K
PDP 11/70 Basic Plus 2-Fortran $30K
SOFTWARE MVS CICS/TCAM $34K
HP 3000-Image Query COBOL MBA 20% trvl $29-31K
VOICE/Data Commun. Mgr $40K
SOFTWARE Mgr DOS/VS CICS $40K
SOFTWARE MVS JES 2 Network job entry $34K
IMS Database design analyst $29-34K
SYSTEMS Anal On line banking BAL COBOL PL1 ..... $31K
ANALYST Prog PL 1 IMS $29-31K
EDP Auditor/Intl 50% trvl $31-35K
PROJ Mgrs on-line nationwide banking systems $37-41K
PROJ MGR retail banking als mktg $29-40K
ANAL Prog foreign exchnge mini basic plus $31K
CONSULTANT DOS DL 1 Banking $34K
PDP RSX 11 cnsltnt Real time trning $35K
UNIVAC Exec 8 applicatns software Fortran ..... $Open
WANG VS interactive COBOL finctl $25K
8-4800 on line degree $26-34K
INSTRUCTOR digital, analog VS syst $30K
CRT Design engr $40K
DIAGNOSTIC Prog anal hardware & software new releases CPU's $36-39K
PRODUCT Mgr word process $31-39K
SOFTWARE VS 1 DM $27K
MEDICAL Systems anal realtime minis $36-41K

Call Bill Borrelli
(212) 349-3610
WM HARRIS ASSOC
150 Broadway agency
New York 10038

PROGRAMMER

WANTED
RELOCATE TO NY/NJ METRO AREAS

PROGRAMMERS/$22K

1-3 years of growing exp with current programming skills in COBOL, DOS/OS,VS. Manufacturing or Accounting bkgd helpful.

PROG ANALYST/$26K

Multiple opptles available throughout NY/NJ for OS/COBOL Professionals. Insurance, Banking, Mfg Apps preferred. Exellent bnfts.

SR. PROG/ANALYS/$28K

Billion $ national corp in NJ Metro area seeks Sr. Sys or Project Ldr with solid financial related systems exp. Exceptional bnfts.

SYS PROGS/$30K

Indiv to support large-scale IBM shop and prepare technical recommendations to management. Requires 3 + years heavy support bkgd, MVS and DB exp. On-going training program. Excint growth oppty.

SYSTEMS ANAL/$30K

We are seeking qualified people in search of a forward thinking high technology organization which moves quickly. This is an excellent oppty for EDP Professionals having at least 2-6 years IBM/OS exp. Required is exposure in Systems Analysis and Program design using COBOL, FORTRAN and Data Base Storage Techniques. Position offers a challenging environment and excellent opptles for personal development and career growth.

For further information call/write **ARNIE BROCHE/STEVE DANIELS at 201-265-1818 at 15 Prospect St., Paramus, New Jersey 07652.**

Steeple Associates, Inc.
PARAMUS

MANAGEMENT CONSULTANT SYSTEMS ORIENTED

Ideal candidates will have a minimum of two years experience as a systems and programming analyst; FORTRAN and/or COBOL experience, excellent communications skills, and a facility for solving varied client problems.

We offer a creative and stimulating working environment, an attractive career path in consulting, and a salary commensurate with experience and excellent benefits.

Boston, Schneider & Associates
2021 Spring Road
Oak Brook, Illinois 60521
Attn: Ronald Gnau
Principal

DIRECTOR OF COMPUTER SERVICES $27,371 to $34,182

BA Degree in computer science or equivalent; three years experience in design and programming of timesharing computing systems to include one year supervisory/management responsibilities; plan organize and direct computer center staff. **DEADLINE: 4 pm 1/31/80; APPLY Personnel Office, Solano College, P.O. Box 246, Suisun City, CA 94585, (707) 864-7000.**

MIS PROFESSIONALS

Corporate Staff, Florida Location

Harris Corporation is an established (Fortune 500) leader in Communications and Information Processing. The following immediate career opportunities exist for experienced MIS professionals at our Corporate Headquarters located in Melbourne, Florida.

LEAD PROGRAMMER/ANALYST: Seeking an individual with five (5) plus years experience in programming, analysis and project roles in financial systems. Candidate should possess a degree in Computer Science or Accounting or will consider experience in lieu of degree. Must have knowledge of COBOL, OS, JCL, and be familiar with database systems (preferably IDMS and CFMS).

PROGRAMMER/ANALYST: Seeking qualified candidate for a corporate staff assignment in our financial systems area. The ideal candidate should be a degreed (Computer Science or Business Administration or related experience) programmer/analyst with 2-4 years experience. Must have knowledge of COBOL, OS JCL and be familiar with database systems (preferably IDMS).

In addition to excellent salary, benefits and liberal relocation assistance, these are high visibility growth situations in one of the nation's most desirable locations.

For immediate consideration, please forward resume and salary history in confidence to: Manager, Corporate Staffing, Harris Corporation, Melbourne, Florida 32919.

HARRIS
COMMUNICATION AND INFORMATION PROCESSING

An Equal Opportunity Employer—Male and Female

PROGRAMMER ANALYSTS

At Valley National Bank we are now in need of Programmer Analysts to augment our present staff.

If you are qualified in the following areas:

IBM 370/158 & 168, OS/VS COBOL & ALC.

...and would like to become part of our successful company send your resume with salary history to:

VALLEY NATIONAL BANK
PO Box 71/CW1 A301
Phoenix, AZ 85001
An EOE/MF

Valley National Bank of Arizona

PROGRAMMER — ANALYST: SCIENTIFIC

Expansion has created a vacancy with multi-facility Health Care Corporation. B.S. degree or equivalent in Mathematics or Physical Science. Experience with FORTRAN or assembler with DEC and Data General assemblers highly desirable. Responsible for programming support of clinical data collection, analysis and reporting. Assists in evaluation of software products and consults in use of mathematical and statistical procedures for data reduction and analysis. Mail resume to:

The Baptist Medical Centers
Human Resources
3201 6th Avenue South
Birmingham, Alabama 35233
Equal Opportunity Employer M/F/H

TRW

Hi-speed Digital Array Processors

A NEW VENTURE!

TRW ELECTRONICS has started a new Division in the San Francisco Bay Area to produce array processing systems for commercial markets.

TRW brings to this effort:
- ***Extensive background in hi-speed digital processing***
- ***Technology/market experience — people — reputation***
- ***Top management commitment***

This is a unique opportunity for innovative Engineers to build a new product family and a new company!

PhD Engineer/ Mathematician

Develop user level specifications for next generation array processors which will satisfy requirements for efficient application to emerging markets and new technologies.

Prefer PhD with experience in system identification, control theory, linear and recursive estimation, digital signal processing, pattern recognition and optimization methods for seismic, image, sonar, biomedical and other data processing applications.

The ideal candidate will have strong interests in design issues such as algorithm development at the chip level, definition of processing systems, and formal methods for process specification.

Senior Hardware Architect

Provide technical leadership to a team of senior professionals for product specification and tradeoff analysis. Must be able to define architectural concepts and allocate them into specific hardware/software modules.

Desirable expertise: simulation, mulitprocessor systems, parallel-synchronous machines, high speed bus and memory design, microprogram assistance for high level languages, SW familiarity, and high speed logic. Requires MSEE/CS and 10 years' experience.

Senior Software Architect

Lead a team in defining the software architecture of the product. This encompasses languages, code optimizing, operating system, and support systems. Work closely with mathematician and hardware architect in simulating the design and performing hardware/software tradeoffs. An innovative person is desired who will chart the direction of new vector and data flow languages. MSEE/CS is required with demonstrated ability to specify software at a high level. Must have extensive experience with multiprocessor systems and parallel/pipelined machines.

Other GROUND FLOOR OPPORTUNITIES also available!

If you have a proven track record and you're ready for a challenge, call us at (408) 734-0381 or send your resume to: ***Maggi Bitter,*** Dept. C-1, TRW ARRAY PROCESSORS, 415 Tasman Drive, Sunnyvale, CA 94086. Individuals only apply!

A Company Called **TRW**

TRW Array Processors

TRW is an equal opportunity employer.

ADVANCEMENT OPPORTUNITIES LOCAL or NATIONWIDE

Hundreds of listings — ALL LEVELS — top companies, all sizes, all industries. Starting salaries $18,000 to $42,000. Companies pay fees and expenses.

Systems Design & Development	Information Systems
Materials Management Systems	Financial & Accounting Systems
Scheduling & Production Control	Scientific & Engineering Systems
Network Design & Control	Manufacturing Applications
Long-Range Planning	Banking Applications
Data Management	Insurance Applications
Software Packages	Hospital Applications
Data Processing Training	Retail & Wholesale Applications

For more details, send your resume, or call:
Mark Fuller
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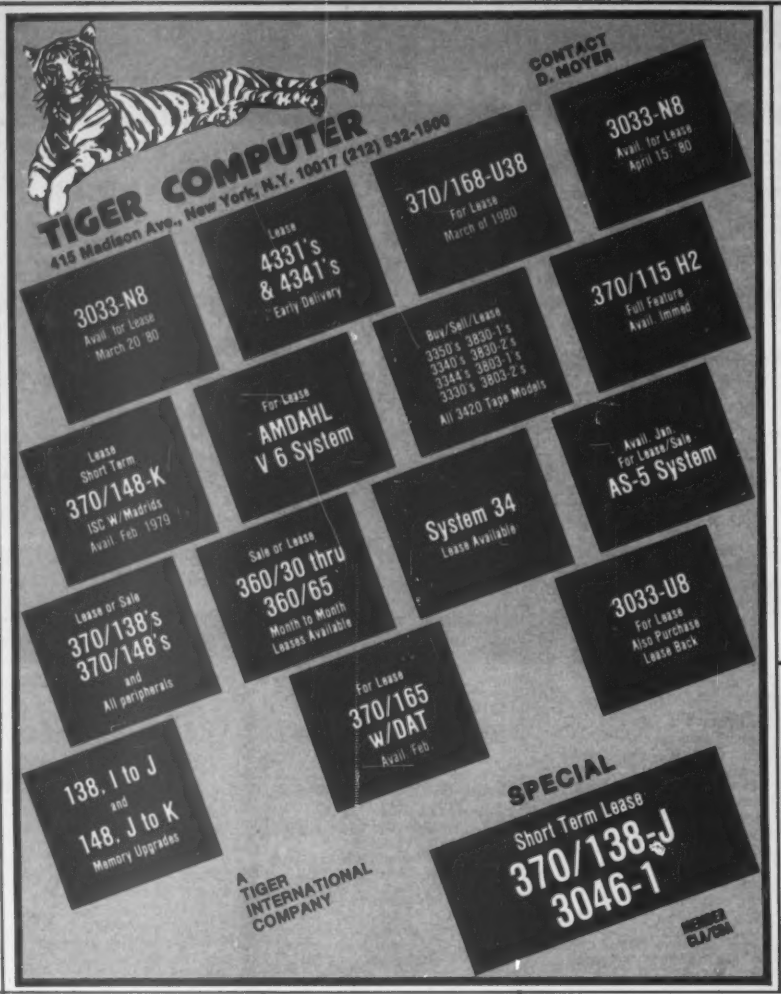

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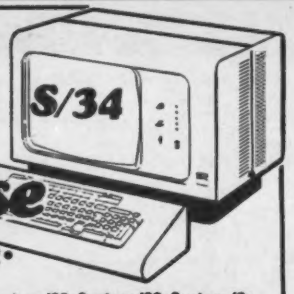

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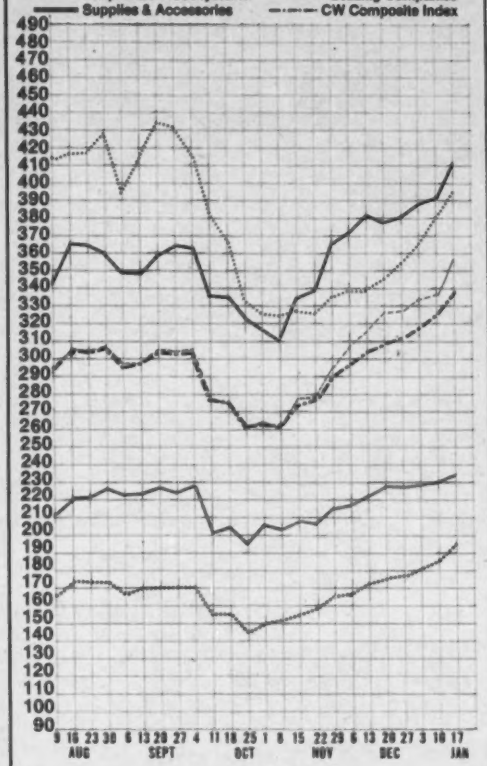

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TRADE QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, JANUARY 16, 1980

All statistics compiled, computed and formatted by TRADE QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

E X C H		1979-80 RANGE (1)	CLOSE JAN 16 1980	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMDAHL CORP	17- 60	25 7/8	+1 1/2	+6.1
N	BURROUGHS CORP	59- 87	80 5/8	- 3/4	-0.9
O	COMPUTER AUTOMATION	9- 44	13 1/4	0	0.0
N	CONTROL DATA CORP	23- 60	59 7/8	+4 1/8	+7.3
O	CRAY RESEARCH INC	8- 51	49 1/2	+1	+2.0
N	DATA GENERAL CORP	42- 74	66 1/2	+7 1/4	+12.2
N	DATAPOINT CORP	34-113	112 5/8	+9 7/8	+9.6
N	DIGITAL EQUIPMENT	39- 70	70 1/8	+1 5/8	+2.3
N	ELECTRONIC ASSOC.	2- 13	8 1/2	+ 3/4	+9.6
A	ELECTRONIC ENGINEER.	9- 19	18 1/8	+ 1/2	+2.8
N	FOUR-PHASE SYSTEMS	19- 47	33	- 5/8	-1.8
N	FORDORO	26- 54	39 1/4	+1 1/2	+3.9
O	GENERAL AUTOMATION	7- 26	17 1/8	+ 1/8	+0.7
O	GRI COMPUTER CORP	1- 3	1/2	0	0.0
N	HEWLETT-PACKARD CO	24- 83	82 1/8	+2 7/8	+4.8
N	HONEYWELL INC	43- 89	89 1/8	+5 1/2	+6.5
N	IBM	62-321	78	+4 5/8	+7.0
O	MANAGEMENT ASSIST	9- 29	16 7/8	-1 7/8	-10.0
O	MANUFACTURING DATA S	9- 38	36	+ 1/2	+1.4
O	MINI-COMPUTER SYST	2- 8	4 1/2	+1 3/8	+44.0
O	MODULAR COMPUTER SYS	7- 18	12 1/4	- 1/4	-2.0
N	NCR	37- 81	78 7/8	+6	+8.2
N	PRIME COMPUTER INC	9- 27	26	+2	+8.3
N	PERKIN-ELMER	17- 45	43 1/2	+ 3/4	+1.7
N	SPERRY RAND	33- 57	57 1/8	+5 5/8	+10.9
A	SYSTEMS ENG. LABS	11- 24	19 5/8	+ 3/4	+3.9
O	TANDEM COMPUTERS INC	13- 43	42	+ 1/4	+0.5
A	WANG LABS.	6- 36	35 7/8	+2 1/4	+6.6

LEASING COMPANIES

O	BOOTHE FINANCIAL CP	13- 21	16 1/2	- 1/2	-2.9
O	COMDTSCO INC	3- 21	19 3/4	+2 1/2	+18.8
A	COMMERCE GROUP CORP	1- 1	3/8	0	0.0
A	COMPUTER INVSTRS GRP	1- 7	3	+ 1/2	+20.0
O	CONTINENTAL INFO SYS	3- 15	4	+ 1/2	+14.2
N	DATHONIC RENTAL	1- 4	2 5/8	0	0.0
A	DCL INC	3- 6	5 1/8	- 1/8	-2.3
N	DPF INC	8- 14	7 5/8	- 3/8	-4.6
N	ITEL	4- 35	5 5/8	+ 1/2	+9.7
N	LEASCO CORP	24- 68	58	- 3/4	-1.2
O	LEASPAC CORP	1- 4	1/8	0	0.0
A	PIONEER TEX CORP	2- 7	3 1/2	- 3/8	-9.6
N	U.S. LEASING	12- 29	16	+1 3/4	+12.2

SOFTWARE & EDP SERVICES

O	ADVANCED COMP TECH	1- 2	1	0	0.0
O	ANACOMP INC	8- 24	18	+ 3/4	+4.3
O	ANALYSTS INTL CORP	3- 6	5 3/4	+ 1/2	+9.5
A	APPLIED DATA RES.	8- 17	9	+ 1/8	+1.4
N	AUTOMATIC DATA PROC	24- 48	38 1/4	+2 1/4	+6.2
O	COMPU-SERV NETWORK	5- 18	18 1/8	+ 1/8	+0.6
O	COMPUTER HORIZONS	1- 9	5	+ 1/2	+11.1
O	COMPUTER NETWORK	5- 16	6 5/8	+ 1/8	+1.9
N	COMPUTER SCIENCES	8- 21	21 1/8	+1 7/8	+9.7
O	COMPUTER TASK GROUP	1- 7	7	+ 1/4	+3.7
O	COMPUTER USAGE	2- 4	3 7/8	+1 1/8	+48.9
O	COMPUT AUTO REP SVC	4- 10	7 1/8	+1 3/8	+23.9
O	COMSHARE	6- 26	20	+2	+11.1
O	CULLINANE CORP	14- 33	28	- 1/2	-1.7
O	DATA DIMENSIONS INC	1- 9	1 5/8	- 1/4	-13.3
O	DATATAB	1- 4	1 1/8	- 1/8	-10.0
O	OSI CORP	4- 8	7 1/2	+ 3/4	+11.1
N	ELECTRONIC DATA SYS.	15- 28	26 5/8	+ 1/8	+0.4
O	INSYTE CORP	1- 3	1 3/8	0	0.0
O	IPS COMPUTER MARKET.	2- 3	3	0	0.0
O	KEANE ASSOCIATES	3- 8	7 1/2	+1 1/4	+20.0
O	KEYDATA CORP	1- 5	4 5/8	+ 7/8	+23.3
A	LOGICON	10- 21	20	+ 1/4	+1.2
O	NATIONAL DATA CORP	7- 17	16 3/8	+ 1/4	+1.5
N	PLANNING RESEARCH	4- 10	7	+ 1/4	+3.7
O	PROGRAMMED TAX SYSTS	3- 5	4 7/8	+ 3/4	+18.1
O	PROGRAMMING & SYS	1- 1	7/8	0	0.0
O	RAPIDATA INC	3- 7	5 1/4	+ 1/4	+5.0
O	REYNOLDS & REYNOLD	18- 36	27	0	0.0
O	SCIENTIFIC COMPUTERS	3- 12	11 3/4	+ 3/4	+6.8
N	TYMSHARE INC	18- 54	52 1/4	- 3/4	-1.4
A	URS SYSTEMS	5- 10	8 5/8	- 1/4	-2.8
N	WYLY CORP	1- 7	7	+ 7/8	+14.2

PERIPHERALS & SUBSYSTEMS

N	AM INTERNATIONAL	13- 32	17	- 7/8	-4.8
N	AMPEX CORP	10- 22	21 1/2	+ 7/8	+4.2
O	ANDERSON JACOBSON	5- 16	15 7/8	+1 3/4	+12.3
N	APPLIED DIG DATA SYS	6- 22	8 7/8	- 1/4	-2.7
A	AUTO-TROL TECHNOLOGY	14- 38	38	+5 1/2	+16.9
O	BEEHIVE INT'L	3- 7	5 5/8	- 1/4	-4.2
A	BOLT,BERANEK & NEW	8- 19	16 1/2	- 1/2	-2.9
N	BUNKER-RAMO	10- 31	29 3/4	- 5/8	-2.0
O	CAMBRIDGE MEMORIES	1- 9	1 7/8	- 1/8	-6.2
O	COMPUTER DEVICES INC	5- 9	9 1/4	+1 3/8	+17.4
N	CENTRONICS DATA COMP	10- 54	38 7/8	+7 3/8	+15.9
O	COGNITRONICS	1- 4	2 7/8	- 1/8	-4.1
O	COMPUTER COMMUN.	8- 10	5 7/8	- 3/8	-6.0
O	COMPUTER CONSOLES	4- 23	22 1/2	+4 1/2	+25.0
A	COMPUTER EQUIPMENT	3- 6	6 1/8	- 1/4	-3.9
O	COMPUTER TRANSCEIVER	1- 5	3 3/8	0	0.0
O	COMPUTERVISION CORP	5- 58	57 1/4	+3 1/8	+5.7
N	CONRAC CORP	13- 26	19	+ 1/4	+1.3
N	DATA ACCESS SYSTEMS	8- 11	10 1/8	- 1/8	-1.2
A	DATA PRODUCTS CORP	13- 25	22 1/4	+2 1/4	+11.2
O	DATUM INC	2- 6	2 3/8	+ 1/8	+5.5
O	DECISION DATA COMPUT	2- 6	3	+ 3/8	+14.2
O	DELTA DATA SYSTEMS	1- 1	7/8	0	0.0
N	DOCUMATION INC	8- 34	17	+1	+6.2
O	DATARAM CORP	6- 35	32 1/2	- 1/2	-1.5
N	ELECTRONIC M & N	3- 9	4 1/2	+ 1/2	+12.5
O	EVANS & SUTHERLAND	20- 42	30	+1	+2.6
O	FABRI-TEK	1- 2	1	+ 1/8	+14.2
N	GENERAL COMPUTER SYS	1- 3	2 1/8	0	0.0
O	GENERAL DATACOMM IND	9- 24	23 3/4	+ 3/4	+3.2
N	HAZELTINE CORP	10- 26	25	0	0.0
N	HARRIS CORP	17- 39	38 7/8	+2 1/4	+6.1
O	INFOREX INC	1- 11	1 7/8	+ 1/8	+7.1
O	INFORMATION INTL INC	7- 12	11 3/4	+1 3/4	+17.5
O	INFOTON	1- 4	3 1/4	+ 5/8	+23.8
O	INTEL CORP	20- 72	70 1/2	+ 3/4	+1.0
O	INTERSIL	7- 32	25 7/8	- 1/8	-0.4
A	LUNDY ELECTRONICS	4- 10	9 1/2	+1 1/4	+15.1
O	MSI DATA CORP	6- 19	10 5/8	+1 7/8	+21.4
N	MEMOREX	17- 59	17 5/8	+ 1/8	+1.4
N	MOHAWK DATA SCI	6- 18	16 1/2	- 1/8	-0.7
O	OMEX	2- 9	9	+ 1/2	+5.8
O	PARADYNE CORP	9- 31	30 1/2	+4 1/8	+15.6
A	PENRIL CORP	5- 15	13 3/4	0	0.0
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	RANTEK CORP	7- 14	15 1/8	+1 5/8	+12.0
O	RECOGNITION EQUIP	5- 13	7 5/8	+ 1/2	+7.0
O	SCAN DATA	1- 5	2 1/2	+ 1/8	+7.9
N	STORAGE TECHNOLOGY	14- 46	15	-2	-11.7
O	SYKES DATATRONICS	4- 23	24 1/2	+1 3/4	+7.6
O	T BAR INC	11- 26	24 3/4	+ 3/4	+3.1
O	TEC INC	6- 13	6	- 3/8	-5.8
N	TEKTRONIX INC	33- 63	62 1/4	+4 1/2	+7.7
N	TELEX	3- 9	3 7/8	- 1/4	-6.0
O	TESDATA SYSTEMS CP	8- 26	11 1/2	+ 3/4	+6.9
O	TIMEPLEX INC	4- 11	12 1/4	+1 7/8	+18.0
O	WILTEK INC	1- 2	1/4	0	0.0

SUPPLIES & ACCESSORIES

A	AMERICAN BUS PRODS	6- 12	10 5/8	- 5/8	-5.5
O	BALTIMORE BUS FORMS	1- 4	1	0	0.0
N	BARRY WRIGHT	14- 34	24 5/8	-1 5/8	-6.1
O	CYBERNATICS INC	1- 1	1	0	0.0
O	DUPLEX PRODUCTS INC	13- 31	26 1/2	+ 1/2	+1.9
N	ENNIS BUS. FORMS	5- 21	17 7/8	+ 7/8	+5.1
N	3M COMPANY	43- 66	48	-1 3/8	-2.7
O	MOORE CORP LTD	26- 34	31 1/2	+1 1/2	+5.0
N	NASHUA CORP	18- 37	29 7/8	+1 1/8	+3.9
O	STANDARD REGISTER	20- 29	27 1/2	+1	+3.7
A	TAB PRODUCTS CO	8- 19	17 1/2	+ 3/8	+2.1
A	WABASH MAGNETICS	10- 22	14 3/8	- 1/4	-1.7
N	WALLACE BUS FORMS	18- 33	30 1/4	+1 7/8	+6.6

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